



Managing the public health impacts of **natural resource extraction activities**

A framework for national and local health authorities

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DISCUSSION DRAFT



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Foreword

Health is both a prerequisite for, and a measure of, sustainable development. Without a healthy population, a nation's economy will not prosper. Progress in social/human development is often measured in terms of health gains, as for instance in the Millennium Development Goals.

This guide provides a framework for action that countries can use to identify and address many of the environmental, social and institutional causes of disease that are limiting their health and development potential, particularly in the context of extractive industries (oil and gas, mining), which can be of vital importance to developing economies. The environmental and health impacts of extraction activities are often considerable, negative and predominantly borne by the weakest segments of society, i.e. poor women and children living and working in close proximity to extractive industry operations. For this reason, and because of the dearth of good practice guidance available to governments on how to deal with the environmental and social impacts of extractive industry, this sector was chosen as a priority and the orientation of this guide.

Considerable health and development gains would accrue from increased action to address the root causes of disease associated with extractive sector activities, particularly to developing countries. A more systematic targeting of low-cost public health interventions to address environmental causes of disease (e.g. to ensure adequate and safe drinking water and sanitation; to ensure air quality; to prevent exposure to hazardous chemicals and waste) could prevent an estimated 13 million deaths per year. The greatest number of lives spared would be in developing countries, primarily among women and children.

Similarly, significant shared benefits for health and development remain unrealized through lack of alignment between sector interests, policies and resources. This could be due to a lack of awareness of potential joint benefits and may be influenced by the existence of institutional barriers which traditionally have divided sector functions. It may also be due to the fact that there are not enough examples and tools available on how to achieve such alignment.

It is my hope that this guide and the framework described herein will be tested, adapted and improved by all countries engaged in natural resource extraction activities and that their efforts to anticipate and respond to the public health impacts associated with such activities will be facilitated by this contribution.

1. Introduction

International demand for fossil fuels and mineral resources is constantly growing. Their extraction has thus become an important engine of the modern economy and a major contributor to global trade. Non-renewable natural resources can drive national economic growth and health and human development in the countries in which these resources are located. However, many countries have been unable to harness this potential. Instead, they are plagued by the "resource curse", whereby countries experience decreased economic growth and slower or lesser rates of democratization, despite having large quantities of oil, gas or other minerals (Sachs et al., 2002; Haber et al., 2010).

Several reasons drive this "paradox of plenty" (Auty R., 1993; Haber et al., 2010). When new resources or deposits are found in a country, high expectations are often generated. Governments become greatly interested in using the potential revenues generated by natural resources to diversify production and promote a "big push" in industrial development, in order that their country may move up the economic ladder from low- to middle- or high-income status. Governments seek to balance an often urgent interest in converting these resources into financial and social wealth with a need to safeguard the rights and needs of future generations. Unfortunately, these expectations of wealth often lead to an overestimation of the possible short-term economic gains and an underestimation of the long-term environmental, health and societal costs – costs that are associated with too rapid or inadequate consideration of the full range of implications resulting from the conversion of resource wealth.

The scope and scale of socioeconomic change, as well as pressure from larger interests such as developed nations and multinational corporations, can overwhelm a developing nation's capacity to foresee the risks, impact and benefits, and to plan for and develop appropriate governance, oversight, accountability and distribution mechanisms to handle the revenues as well as the social, demographic, and environmental changes that inevitably ensue.

The health sector can play a crucial role in supporting these governance and decision-making processes. It can do so by defining priority public health concerns among affected populations and by articulating a vision and strategy of what needs to be done by each sector in order to address those health issues.

The early engagement of the health sector and consideration of the human health implications of extractive industries' activities will also help to avoid unforeseen costs arising from preventable negative health outcomes. Such costs - sometimes referred to as the hidden costs of development - would otherwise have to be borne by industry, by the health sector, and by the people (World Health Organization, 2003).

Greater integration of health issues into governance mechanisms used for extractive industries' activities could also provide governments (and the people) with a means to measure the extent to which extractive industries' activities have contributed to human development. Thus, health status can be used as a measure of the social value generated or lost as a result of the conversion of natural resource wealth.

This guide has been developed in order to assist national and local health sector actors to facilitate and contribute to the governance processes of national extractive industries.

1.1 A framework to support health in all policies

Health is largely determined by environmental, social, behavioural and institutional factors that are themselves influenced by policies and activities outside the health sector. The potential public health return on investments in early identification and management of these health determinants is considerable. In order for countries to reap this benefit, public health objectives must be considered early on as part of policy and investment decisions, often in economic and social sectors where health authorities traditionally have little control.

The health sector cannot on its own prevent health problems that may arise from developments in another sector: it has neither the authority nor the resources to do this. What it can do, however, is to take a lead in identifying what those public health issues may be. It can articulate a clear vision and plan, define what each player (e.g. government agencies, private sector actors) can do to address the health issues, and provide the tools and capacity needed to support that process.

New challenges of the 21st century have made policy-making increasingly multidimensional, bringing together different levels of governments as well as different sectors. Although there is growing health sector discourse about the need for action to address the social determinants of health (a key means to tackle the world's growing global health inequities), there are few practical examples of how this can be done.

Health in All Policies - a policy objective "which aims at influencing health determinants so as to improve, maintain and protect health" - is the answer offered by the health sector to tackle the above challenges (Milho et al., 2006). It is rooted in basic principles of health promotion, and is a core pillar of primary health care (World Health Organization, 2008). Health in All Policies is attracting renewed interest, firstly because of increasing evidence that the root causes of diseases lie in other sectors, and secondly because of rising public health costs, attributed to inaction in addressing those root causes. Although there are good practices examples of Health in All Policies, by and large countries are far from implementing this approach systematically.

In order to achieve Health in All Policies, the health sector itself must first recognize the important role that other sector policies can play in influencing people's health. Unfortunately, health systems in many countries are still focused largely on curing disease rather than preventing it. Few resources are therefore dedicated to broader prevention initiatives and even less attention is paid to preventive actions outside the health sector's direct control. Furthermore, other sectors need to be persuaded that their policies might have consequences for the health of the population and that therefore the health consequences of their policies and plans need to be considered. Identification and management of the impacts on health of a given sector policy, plan or project must be a participatory process that engages all levels of government as well as other stakeholders, including population groups that may be affected.

As countries have different historical, political and social backgrounds, the ease with which the health sector can facilitate the above processes varies widely. The specific tools, methods and entry points used to integrate and address health issues in other sectors also differs, depending on the country's needs and context.

This guide provides a framework to support the early inclusion of health considerations in the extractive industry sector planning process, and to support the engagement of the health sector in wider extractive industries governance and impact management activities.

Although the guide focuses on issues specific to extractive industries (primarily for oil and gas, and mining), the overall health impact management framework provided could be adapted and used in any sector.

1.2 Audience and intended uses

The guide was developed for national and local health authorities in countries (particularly developing countries) with large-scale natural resource extraction activities (mining, oil and gas development). Other sectors, including government agencies such as environment, energy, labour, natural resources, may also benefit from the information provided, if only better to understand health impact assessment and the related processes and tools.

It provides a framework for identifying and managing public health impacts associated with typical extractive industries' projects. It should be noted that this applies not only to negative impacts - i.e. those that can be avoided or mitigated - but also to benefits and positive impacts (in terms of health gains) that can be harnessed or enhanced.

Where possible, examples are provided of lessons learned by countries and projects that have had experience with use of tools, systems, and processes covered in the guide.

The guide is divided into six sections:

Section 1 provides an overview of the rationale, background and purpose of the guide.

Section 2 provides an in-depth examination of the Chad-Cameroon Petroleum and Pipeline Development Project. This case-study highlights some of the key public health issues associated with large natural resource extraction projects, and some of the challenges faced and lessons learned while managing them.

Section 3 provides an overview of some of the main public health issues associated with oil and gas, and mining projects.

Section 4 provides an introduction to health impact assessment, one of the main instruments used to identify potential health issues associated with policies, plans and projects implemented in different sectors, and to recommend intervention options to avoid or address those impacts. Samples of the use of health impact assessment are provided.

Section 5 describes some of the tools and systems used to monitor, respond to and manage health impacts as they arise.

Section 6 outlines a framework for the institutionalization of health impact assessment and related health impact management systems in a given country.

Additional information and resources are provided as annexes.

Occupational health and safety issues are not dealt with explicitly in this guide as these are often the purview of separate occupational health laws and protocols. In practice, even though the links between worker and community health issues are often blurred, synergies between occupational health and community health are not frequently explored. The impact management framework outlined herein takes note of these potential synergies. The content could thus be of interest and relevance to various government authorities (environment, labour, energy, minerals), project proponents, and operators of projects in the mining, and oil and gas sectors.

The guide covers mainly the “upstream” part of the extractive industry, also known as the exploration and production phase. “Downstream” activities, that include mainly refining, selling and distribution, are not covered explicitly. However, the tools, instruments and overall approach

described may be adapted and used to address wider public health issues associated with those latter activities.

2. Lessons from the Chad-Cameroon Petroleum and Pipeline Development Project

The Chad-Cameroon Petroleum and Pipeline Development Project is the largest public/private oil and gas development project ever implemented in sub-Saharan Africa. At a total cost of US\$ 6500 million (World Bank, 2009), this project remains the most ambitious, most contentious extractive industries' project ever supported by the international development community. It was to be a major opportunity and model for poverty reduction in Chad and Cameroon, and was expected to be the first example of how to beat the "resource curse" commonly associated with oil in the developing world.

Because of the considerable environmental, social, and governance risks associated with the development of a project of this size, an elaborate impact management system was put in place. Some important and valuable lessons were learned about environmental and social (and health) impact management in the oil and gas sector.

This case example is included here because it remains one of the few for which considerable information is available in the public domain, and which has been the subject of extensive external/public review and analysis, including from the perspective of health. The Chad-Cameroon case was selected also because many of the challenges and issues faced are representative of those likely to confront other developing countries undertaking similar projects.

2.1 Project description

In the late 1990s, roughly 30 years after confirmation of viable oil reserves in southern Chad, the Governments of Chad and Cameroon, with funds from the World Bank, formed an oil consortium in which the primary partners were the two government-owned oil companies (the Tchad Oil Transport Company and the Cameroon Oil Transport Company) and ExxonMobile. This project was by far the largest energy infrastructure project ever considered in sub-Saharan Africa. After in-depth project planning which included environmental and social impact analyses, construction of the pipeline and related ancillary facilities began in 2000.

Crude oil was to be extracted from oil fields in the Doba Basin in southern Chad and transported via a 1075-kilometre pipeline to an offshore processing facility in Kribi, Cameroon.

In addition to the pipeline, infrastructure development activities included upgrading roads, building two pump stations, and the construction of an airport as well as a processing and distribution facility 15 kilometres off the shore of Kribi.

Expectations about the economic and social benefits that would be generated in both Chad and Cameroon were high. The oil fields near Kome, Chad were expected to produce



1000 million barrels of crude oil (valued at US\$ 15 000 million) over a period of 30 years (Jobin, 2003). Several thousand short-term construction and operational jobs were to be provided in Chad and Cameroon.

The first oil was produced in July 2003.

For Chad, oil was and still is the most important and rapidly developing economic sector. In 2004, 33% of Chad's gross national product was generated by the oil industry. By 2007, this figure had risen to 46.9% (OECD, 2009).

2.2 Identification, management and monitoring of environmental, social and health issues

The overall approach taken to identify, manage and monitor project-related environmental, social and health impacts relied upon five core elements:

- (a) **Impact assessment** Given the scale, socioeconomic and political importance of this project, World Bank and International Finance Corporation safeguard requirements for environmental and social impact assessment, resettlement, and indigenous population issues were applied. Some health issues were considered as part of the environmental impact assessment studies performed (see section 2.3 below) but a full health impact assessment was not undertaken.
- (b) **Impact management plans** An environmental management plan was developed in which detailed mitigation measures to address issues such as those related to resettlement and public health impacts were defined. Additional impact management plans were developed for the handling of specific issues such as community resettlement.
- (c) **Independent expert advisory groups** The World Bank Group established two external bodies to monitor the environmental and social impacts of the project as well as its broader development and governance dimensions: the External Compliance Monitoring Group which reported to the International Finance Corporation and the Independent Advisory Group which reported to the public lending arms of the World Bank Group. Key roles of these advisory groups were to work with national technical committees in order to support the impact assessment reviews and to engage in compliance monitoring and performance evaluation activities.
- (d) **Establishment of a multi-layered monitoring system** This included project contractors and operators, national authorities from the two countries and the two independent advisory groups described above.
- (e) **Capacity development** Parallel capacity development programmes were put in place (financed by the World Bank) with a view to developing national capacity to carry out impact assessment activities and regulation, to follow up monitoring and inspection, and for reporting.

2.3 Health impacts

No independent or full-fledged health impact assessment was undertaken for the Chad-Cameroon Petroleum and Pipeline Development Project. Health issues were considered as part of the environmental impact assessment studies. Table 1 provides an overview of the main public health impacts associated with the project. Some of the impacts were identified in the health section of the environmental assessment report, and others (indicated with an *) were later revealed to be associated health impacts.

Table 1: Public health impacts associated with the Chad-Cameroon Petroleum and Pipeline Development Project

Communicable/infectious diseases	Noncommunicable conditions
<p>Sexually transmitted diseases, HIV/AIDS and hepatitis (Priority was given to HIV/AIDS which was identified in the environmental impact assessment as being the dominant health concern, especially for the workforce.)</p> <p>Vector-borne, zoonotic, and parasitic diseases (malaria, schistosomiasis, onchocerciasis)</p> <p>*Respiratory infections (tuberculosis, influenza, etc.)</p> <p>Water-borne and other diseases linked to sanitation and hygiene (diarrhoea, cholera, typhoid)</p>	<p>Accidents and injuries affecting both workers and communities/individuals living and working around pipeline and other project facilities and infrastructure</p> <p>Mental health impacts* triggered or exacerbated by stress of loss of livelihood, greater food insecurity, decline in health status, increased social tension, deterioration in family relationships</p> <p>Anaemia, stunting and other nutrition-related disorders* (not documented because no baseline developed) but a likely effect of the loss of livelihoods</p> <p>Respiratory disorders* associated with dust from vehicular traffic.</p>

*These health impacts were not originally considered during project impact assessment activities, but were later revealed as negative health impacts (authors and Singer et al., 2004).

2.4 Social and environmental changes resulting from the project

The following is an overview of the social and environmental changes that occurred as a result of the project. Each had a bearing on the health impacts described above.

- **Loss of access to land/livelihoods** The livelihoods of an estimated 12 000 people were directly affected by land acquisition (temporary and permanent) that occurred during construction of the pipeline and other project infrastructure and facilities (Barklay & Koppert, 2007). The project also had a direct impact on the livelihoods of fishing communities living and working near the offshore project infrastructure.
- **Population in-migration** resulted in the spontaneous creation of settlements (some with an estimated population of 17 000) next to project sites and facilities, inhabited by individuals seeking income opportunities, temporary employment, etc. These settlements, such as Kome Atan, did not have even the most basic infrastructure (water, sanitation, power), and because they were informal settlements, were not covered by health services.
- **Environmental pollution and/or degradation**, for example due to chemical contamination from oil leakage and spills. According to the **XXX** review, even when the best available technology was adopted, 2000 gallons of crude oil per day could leak undetected. The pipeline traverses several major rivers and could give rise to severe pollution problems. The consortium did not complete and released an emergency oil spill

management plan until 200x. Destruction of the reefs and general disturbance to marine life off the coast of Kribi has adversely affected the livelihoods of XXX local fisherman (Badjeck, 2005). Dust, noise, toxic waste and other environmental impacts were associated with pipeline construction activities.

- **Increase in conflict dynamics** Chad has been characterized by a “profound and enduring” crisis since independence. The exploitation of its oil resources is considered to have increased conflict dynamics in the country. Tensions have risen between the local population and project operators over unresolved grievances regarding inadequate and inappropriate compensation given as part of project resettlement activities. There have been reports of tensions between population and government because of the latter’s claimed lack of interest in ensuring the proper behaviour of the oil operators in the field and the long delay in bringing development projects to the region affected by oil extraction activities. Funds arrived in 2005 but there was a perceived lack of activity to address community needs. Different community groups were concerned about the monetization of society and new concepts of land ownership that supposedly have led to a deterioration in solidarity (Guesnet, 2009).

2.5 Lessons learned and opportunities for improvement

The logic behind the development of the environmental and social impact management framework used in the Chad-Cameroon Petroleum and Pipeline Development Project was considered sound, and perhaps even exemplary, "except for the revealed weaknesses of every link in the chain" (Singer et al., 2004; Independent Evaluation Group of the World Bank, 2009).

2.5.1 Issues associated with the assessment of impacts

The main weaknesses identified in the impact assessment were attributed to two major flaws: a) inadequate scoping of the project footprint; and b) lack of a baseline of core development indicators (including for health). These fundamental flaws eventually undermined the credibility of the impact assessments and related environmental management plans, and virtually eliminated the possibility of measuring the overall development impact (e.g. in terms of poverty reduction) expected from the project.

The following paragraphs provide further details about weaknesses identified with respect to scoping.

- **Gross underestimation of the project’s physical footprint**

Twice as much land was used by the project as was originally anticipated and accounted for in its environmental management plan. As of 2009, the total number of wells drilled in the oil field was 700 - more than double the estimate made during project appraisal (Independent Evaluation Group of the World Bank, 2009). The number of households directly affected by the project was also significantly greater than originally anticipated. Roughly 1000 people (approximately 150 households) were expected to be resettled as a result of the oil field’s development. Environmental management actions and related resources estimates were based on this initial figure. Later studies revealed that the total project-affected population in the oil field’s development area as of June 2006 was about 1640 households or about 12 000 people (Barklay & Koppert, 2007).

- **Inadequate consideration of all potentially affected individuals/populations**

One independent evaluation (Singer et al., 2004) of the health components of the impact assessments undertaken found that only limited consideration was given to potential impacts on

health of communities living and working outside the oil fields in other project-affected areas (e.g. along pipeline routes, near ancillary facilities, seaport). Potential impacts on vulnerable groups, including indigenous populations (e.g. the Pygmy communities living in the forests of Cameroon near the Kribi port, several of which were eventually displaced because of project-related activities) and women and children were not adequately considered (Singer et al., 2004). Women play a key role in subsistence farming in both Chad and Cameroon. Small parcels of land - a primary source of household food - cultivated by women were not included in the impact assessment studies done and therefore were not part of the compensation plans developed to offset adverse project impacts on livelihoods (Independent Evaluation Group of the World Bank, 2009).

- **No consideration of cumulative or potentially induced impacts**

The environmental impact assessment did not take into account the possibility that the oil infrastructure could be used in the future for other oil field development activities in the region (Netherlands Commission for Environmental Assessment, 2004). The existing agreement between the consortium and Chad allows for oil exploration not only in the Doba region, but also in four other regions (Lake Chad, Salamat, Bongor and Doseo) covering a surface area of 104 223.5 square kilometres. The pipeline, whose capacity exceeds the oil flow that can be provided by the Doba fields, could be the first step in further oil development projects in the region. However no comprehensive social and environmental impact assessment covering all potential developments has ever been produced. Nor was consideration given to wider induced social and environmental impacts such as those brought about by population in-migration, creation or expansion of linear infrastructure (roads), or rapid development of the Kribi port area.

Population in-migration, as seen for example in the establishment of the spontaneous village of Kome Atan, proved to be one of the most significant induced impacts of the project.

The assessment of health issues which primarily addressed worker health and safety identified HIV/AIDS as the predominant concern of both communities and workers. Coverage and analysis of community health impacts was very limited. Key health issues attributed to loss of livelihoods and land (e.g. diet/nutritional status, mental health concerns, respiratory disease) were not considered. Again, this may have been because the number of households whose livelihoods were expected to be affected was significantly underestimated. Despite the known link between HIV/AIDS and tuberculosis, potential project impacts on the spread of tuberculosis were not considered (Singer et al., 2004).

2.5.2 *Issues associated with implementation of impact management measures*

- **Limitations of impact management plans** The environmental management plans that were developed were generally regarded as ambitious, given the impacts identified in the various impact assessment reports (Jobin, 2003). However, because many of the potential issues were not fully scoped, the provisions made in the environmental and other impact management plans (e.g. the community resettlement plan) were inadequate. The environmental impact management plans allowed little room for the use of management approaches that were flexible enough to respond to issues that emerged after project implementation. Thus little could be done to address environment and social issues emerging as a result of the ever-growing project footprint.
- **Timing of capacity development activities** Monitoring of the environmental and social impacts of the project was widely seen and understood to be the responsibility of the respective Governments of Chad and Cameroon. In order to facilitate environmental and social monitoring and management activities, the World Bank introduced a technical

assistance programme for capacity development activities. Unfortunately, capacity development activities began after the project infrastructure had been built and oil production had started (Independent Evaluation Group of the World Bank, 2009). When environmental monitoring inspectors were needed, for example during pipeline construction activities, none were available.

- **Reliance upon external experts for advisory services and independent compliance monitoring** The use of the two independent expert groups to provide advisory services for impact assessment activities and for monitoring was considered a model for other oil and gas projects of similar complexity. The weakness of these expert groups was their inability to influence (and require) changes in project design and subsequent actions taken during project operations. Both groups issued monitoring reports identifying problems that needed to be addressed urgently and made repeated recommendations without achieving commensurate results. Many of the recommendations provided by the advisory groups were never implemented, largely because use of those recommendations was at the discretion of the governments, the World Bank and the consortium (Jobin, 2003). There was no mechanism for holding the project proponents accountable for addressing issues raised by the two groups of experts.

A lack of health expertise within the two expert groups and the technical committees set up in each country to play a role in monitoring and reporting was also viewed as a major factor in the lack of action taken to address emerging public health concerns. This was a key reason cited for the Cameroon national technical committee's failure to respond to the independent expert panel recommendations on HIV/AIDS prevention, even though HIV/AIDS was clearly one of the dominant health concerns associated with the project (Jobin, 2003).

- **Inability to align, influence and augment project (and related) resources to address pre-existing health issues** Reinvestment of oil revenues in social infrastructure including health systems was considerably less than originally foreseen in the Project Revenue Management Plan. For political and economic reasons, government willingness to earmark and allocate funds was uneven. Health programmes tended to be implemented late and did not respond to community health needs. Project-led corporate social responsibility programmes to address specific health issues such as malaria and HIV/AIDS were implemented effectively in project-affected areas but they covered only a small part of the affected population.

The Chad-Cameroon case example reveals a range of environmental, social and human health consequences that can result from large-scale natural resource extraction activities. Lessons learned about the challenges associated with anticipating and managing those consequences are valuable to other countries experiencing or embarking on similar development ventures.

3. Public health issues associated with natural resource extraction activities

Large-scale development projects in non-renewable natural resources extraction (e.g. in mining or oil and gas) have a number of associated public health issues. Some of these health impacts are direct consequences of project activities, such as injuries and deaths from road traffic accidents associated with construction activities, but there are also indirect health impacts that are the result of changes in the physical and social environment following the introduction of the project(s).

For example, changes in the physical environment that might result from the construction of a mine or from other project-related infrastructure (e.g. airports, roads, seaports) can have implications for communities whose livelihoods depend on that ecosystem and its resources such as forests, water, or even marine life. Alteration of natural habitats and water flow can also result in increased spread of vectors responsible for transmission of diseases such as malaria or schistosomiasis (commonly associated with deforestation and irrigation activities).

Population in-migration can lead to dramatic changes in the social, psychological, physical and institutional environment. A rapid inflow of migrants (even temporarily) in search of employment or other income opportunities can have serious consequences for communities living in the area. New arrivals might have different ways of life and culture, could rely on different forms of livelihood that might be incompatible with local ones and could carry diseases that are not present in the indigenous populations. An influx of new people (often mostly males) also increases the pressure on existing essential services and infrastructure (e.g. water and sanitation; health care) and may easily lead to overburden and over-exploitation, especially where pre-existing services are already stretched to capacity, which is often the case. Negative impacts on several health and social indicators associated with this boomtown phenomenon have been documented in many countries, even developed ones (Atler et al., 2010).

Such changes in the physical and social environment may affect health because they have a direct impact on the underlying factors that determine health. These factors, or health determinants, include environmental factors, such as air, water, soil quality; social factors (positive such as income opportunities and negative such as increased housing costs); behavioural and lifestyle factors such as tobacco or alcohol use and sexual behaviour; and pressure on infrastructure and services (access to water and sanitation, essential health and social services, transport, civil protection, police, etc.).

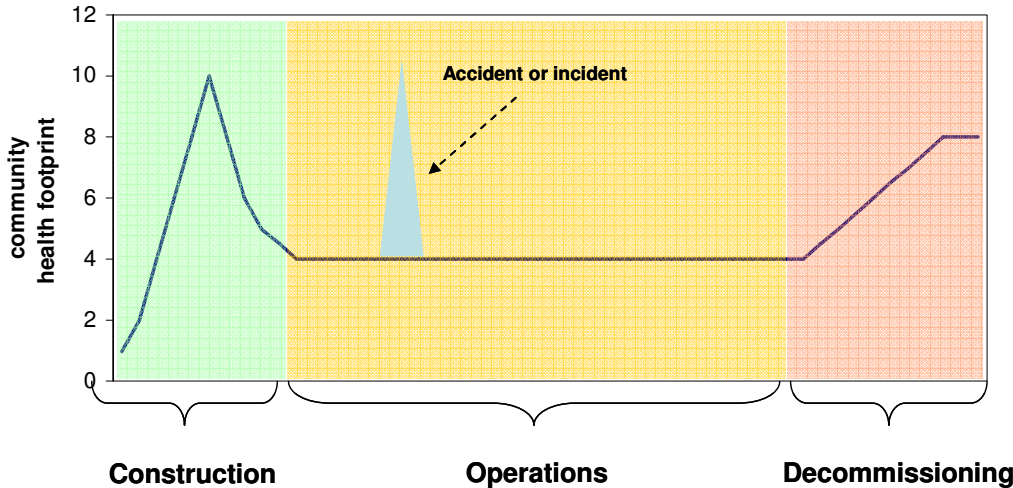
These changes might also have long-term consequences that will be felt after the project has closed or the natural resource has been exploited. For example, costs of medical care and health service provision are usually transferred to the local health system, unless specific plans are made for their repayment from project revenues. In addition, the health problems suffered by workers once they have finished their active professional life are often shifted to the public health budgets, as in the case of coal or asbestos miners. The same is true for the general population in the case of diseases of long duration such as HIV or cancers, or malnutrition with resulting stunted growth in children.

Many of the above types of social and environmental changes (and the resulting health impacts) occur at different stages of the resource extraction process. Even within a specific project there can be significant variation in the types and scale of health issues associated with different project phases, e.g. construction versus operations versus closure or decommissioning.

Fig.1 provides a graphical representation of the potential changes in the scale and scope of the community health impact that can occur over the life cycle of a project. This figure shows how

the nature of health issues can differ across project stages and can sometimes require very different types of interventions.

Fig.1 Public health impacts over the life of a large scale development project



- land use and clearing
- potential population resettlement
- risk of injury from construction activities
- influx of temp construction workforce
- presence of worker camps
- increase in traffic and risk for accident and injury
- Increased demand on health system

- downsizing of workforce
- operations of equipment and machinery
- risk of accident and injury from unforeseen events

- closure of project
- release of remaining workforce
- risk of environmental contamination from project infrastructure (waste)
- loss of income stream for affected community
- Excess health systems capacity

The main public health issues associated with natural resource extraction projects (oil and gas, mining) are outlined in the table below.

Table 2: Main public health issues associated with natural resource extraction projects

Project-led changes and/or pressures	Social/environmental determinant of health	Risks to health	Point in project cycle when changes or impacts most likely to occur
<p>Population influx</p> <ul style="list-style-type: none"> • Development of settlements or camps in rural, remote and/or under-serviced areas • Rapid urbanization and overcrowding • Can be followed by a period of rapid "out-migration" following the end of a construction period when income and employment opportunities decline ("boom and bust" phenomenon) • Rise of artisanal and small scale mining activities (see box 1 for more information on related health impacts) 	<p>Competition for limited resources / livelihood opportunities</p> <p>Higher costs of living (e.g. food, rent) and resulting impacts on household income potential</p> <p>Change in community/social networks and social cohesion</p> <p>Strain on infrastructure and services</p> <p>Change in access to basic services (transport, water, health)</p> <p>Competition for project-related benefits</p> <p>Differential impact on women and children</p>	<p>Change in diet with resulting impacts on nutritional status (if negative, can result in anaemia, stunting and malnutrition in children, etc.)</p> <p>Risk of infectious disease outbreaks (e.g. cholera) and food-borne diseases especially where services and infrastructure (e.g. water and sanitation) are unable to meet demands of rapidly growing population</p> <p>Other infectious diseases such as respiratory infections (e.g. tuberculosis) and other diseases (e.g. measles) associated with overcrowding; malaria and other vector-borne diseases; zoonotic and parasitic diseases, associated with increased breeding of vectors and greater population transmission</p> <p>Sexually transmitted diseases including HIV/AIDS, as well as longer term reproductive health issues associated with mixing of different population groups</p> <p>Noncommunicable diseases (e.g. obesity and diabetes) associated with the arrival of cheap, processed, low nutrition foods</p>	<p>Can occur as soon as there is confirmation of the commercial interest and value of natural resource find. Most often seen during construction phases of projects.</p>

Project-led changes and/or pressures	Social/environmental determinant of health	Risks to health	Point in project cycle when changes or impacts most likely to occur
<p>Rapid rise in expectations regarding wealth/benefits</p> <ul style="list-style-type: none"> • Can accelerate population in-migration • Monetization of society (especially if the pre-project society was composed of subsistence farmers or hunters) 	<p>Exacerbated social tension when expectations not met (e.g. fewer jobs generated; less resources actually found; less income/benefit transferred (and visible) than expected by local population)</p> <p>Increased tensions among different groups within the same community because of conflict between older generation interested in preserving social structure and young people interested in employment opportunities</p>	<p>Stress, and potentially mental health problems</p> <p>Alcoholism, substance abuse</p> <p>Violence/conflict, death and injuries, crime</p>	<p>Often begins as soon as commercial interest and value of natural resource find is confirmed. Decision-making processes such as those related to revenue management planning can significantly increase social expectations of benefits</p>
<p>Land use change</p> <ul style="list-style-type: none"> • Associated with construction and infrastructure development • Deforestation; destruction of ecosystems) • Environmental degradation; • Land clearing; acquisition or loss of land • Loss of biodiversity 	<p>Loss of access to land/source of livelihoods (e.g. fishing area, farmlands)</p> <p>Possible resettlement/relocation of community/household</p> <p>Loss of land/environment of significant cultural importance (e.g. sacred land/trees, source of traditional medicines)</p> <p>Change in ecosystems with resulting implications for sources of water, access to fuel (e.g. firewood), resilience to climate-related events (e.g. mudslides), and impact on biodiversity (loss of species, loss of habitat, loss of access to traditional medicines)</p>	<p>Decreased food security with resulting negative impacts on diet and nutritional status (e.g. anaemia; low birth weight)</p> <p>Change in vector- and pest-borne disease patterns (e.g. malaria; tick-borne diseases) associated with deforestation activities</p> <p>Water scarcity; health problems associated with inadequate quantity and quality of water (e.g. diarrhoeal diseases)</p> <p>Mental health problems, stress (because of loss of access to land/livelihoods)</p>	<p>Likely to occur at the beginning of project development and implementation when land is needed to begin construction of project-related facilities and infrastructure (access roads, buildings, etc.)</p>

Project-led changes and/or pressures	Social/environmental determinant of health	Risks to health	Point in project cycle when changes or impacts most likely to occur
<p>Environmental pollution and pressures</p> <p>(e.g. associated with construction, operations, and or unforeseen events such as spills, fires or explosions. Can also be associated with chemicals used as part of industrial activities or with associated transport activities.)</p>	<p>Chemical contamination of important water sources (water table, rivers, etc.)</p> <p>Chemical contamination of sources of food (e.g. mercury in fish)</p> <p>Chemical contamination of soil</p> <p>Air pollution (e.g. from dust; chemicals released during processing; vehicular emissions; evaporation (e.g. mine tailings); acid rain, in the event of a chemical incident (fire, explosion))</p> <p>Noise</p> <p>More vehicular traffic related to the project</p>	<p>Respiratory diseases (e.g. silicosis, asthma)</p> <p>Change in likelihood of developing cancer (skin, colon, lung. etc.)</p> <p>Skin allergies, dermatological and ophthalmological irritations and/or disorders (e.g. blindness)</p> <p>Mental health problems, stress (because of disturbed environment or change in sleeping patterns)</p> <p>Neurological diseases (e.g. from exposure to heavy metals such as mercury and lead)</p> <p>Cancer from exposure to some volatile organic compounds (e.g. benzene) and some heavy metals (e.g. cadmium and arsenic)</p> <p>Congenital anomalies from <i>in utero</i> exposure to heavy metals and other toxic chemicals</p> <p>Cardiovascular effects; deafness</p> <p>Deaths, injuries and handicaps from trauma related to accidents</p>	<p>Risk of environmental pollution is present at all stages of natural resources development (construction, extraction, transport, processing, decommissioning), as is the risk of unforeseen events that can occur during any of these stages</p>

Project-led changes and/or pressures	Social/environmental determinant of health	Risks to health	Point in project cycle when changes or impacts most likely to occur
Accelerated development	<p>Change in household earning potential (e.g. more disposable income)</p> <p>Change in diet (and quality of diet)</p> <p>Increased sale of cars and motorcycles resulting in more traffic, more air pollution, less physical activity, and greater risk of accident/injury</p> <p>Change in access to basic services/infrastructure (e.g. water and sanitation, health care, education)</p> <p>Sudden change in traditional social structures and practices alters the management of the local environment that has kept communicable diseases under control</p> <p>Development of industrial activities using chemicals and toxic materials. Its waste and wastewater management is often not properly regulated, especially when a new emerging industry.</p>	<p>Nutrition-related diseases (e.g. obesity) and related noncommunicable diseases (diabetes, cardiovascular disease)</p> <p>Respiratory disorders (e.g. asthma) associated with increased ambient air pollution</p> <p>Road traffic related deaths and injuries</p> <p>Decline in infectious diseases, especially those related to water and sanitation; malaria</p> <p>Rapid change of livelihoods</p> <p>Long-term health consequences such as cancers or birth defects</p>	<p>Most likely to become evident as part of the legacy of the development of the resource; mainly seen where there is a rapid change in the socioeconomic conditions of a given population</p>

Box 1: Artisanal and small-scale mining - an induced impact of large mining projects that can have significant environmental, social and health consequences

One of the most commonly observed induced impacts of large mining projects is the influx of artisanal or small-scale miners to the region. Artisanal and small-scale mining is a form of subsistence mining that is labour intensive and utilizes rudimentary extraction techniques. More than 100 million people throughout the developing world depend directly or indirectly on such mining for their livelihood. (ILO estimates 2010; ICMM 2010 - web site). In many parts of the world, artisanal and small-scale mining is at least as important as large-scale mining activities, particularly in terms of the numbers of people employed (International Council of Mining and Metals, 2003).

Immigration by artisanal and small-scale miners is a common occurrence around large-scale mining projects and can have long-term and lasting negative environmental, social and – ultimately - health consequences. This in-migration can bring about major environmental and social (demographic) changes which in turn can have a major impact on the health of communities that were living in those areas prior to the introduction of the project. For example, the migration of artisanal and small-scale miners to a large-scale mining area may occur with such rapidity that it can quickly overwhelm existing populations and local resources, especially in rural, remote, and/or underdeveloped areas.

Some of the main environment and health impacts associated with ASM include: environmental degradation and pollution, chemical poisonings (for example because of exposure to chemicals associated with the extraction process, including mercury, cyanide, arsenic, and sulfuric acid), accidents and injuries (associated with poor occupational health and safety conditions), violence, spread of infectious diseases (including sexually transmitted diseases), and water borne diseases (due to a lack of adequate drinking water, sanitation, and hygiene). [See Annex 2 for more information about the health impacts associated with ASM.]

Women and children are often most heavily affected by the negative environment and health impacts of ASM. Women in artisanal and small-scale mining traditionally do not enjoy the same status as their male counterparts and are therefore less likely to receive medical attention when needed (Hinton, Veiga & Beinhof, 2003). Because they are smaller physically, children are more likely to participate in highly dangerous artisanal and small-scale mining activities such as crawling through mine shafts and being lowered into open vein deposits. Children are also much more likely to participate in mercury amalgamation in the gold mining setting. In the artisanal gold mining camps of Mongolia, an alarming 60% of those directly involved in mercury amalgamation are children and approximately 20% of them report kidney and urinary diseases (Navch et al., 2006).

The early assessment of potential health impacts associated with natural resource extraction activities (i.e. the potential for artisanal and small-scale mining to occur) can facilitate the identification of interventions and the monitoring and surveillance systems needed to detect and respond to health issues.

4. Health impact assessment

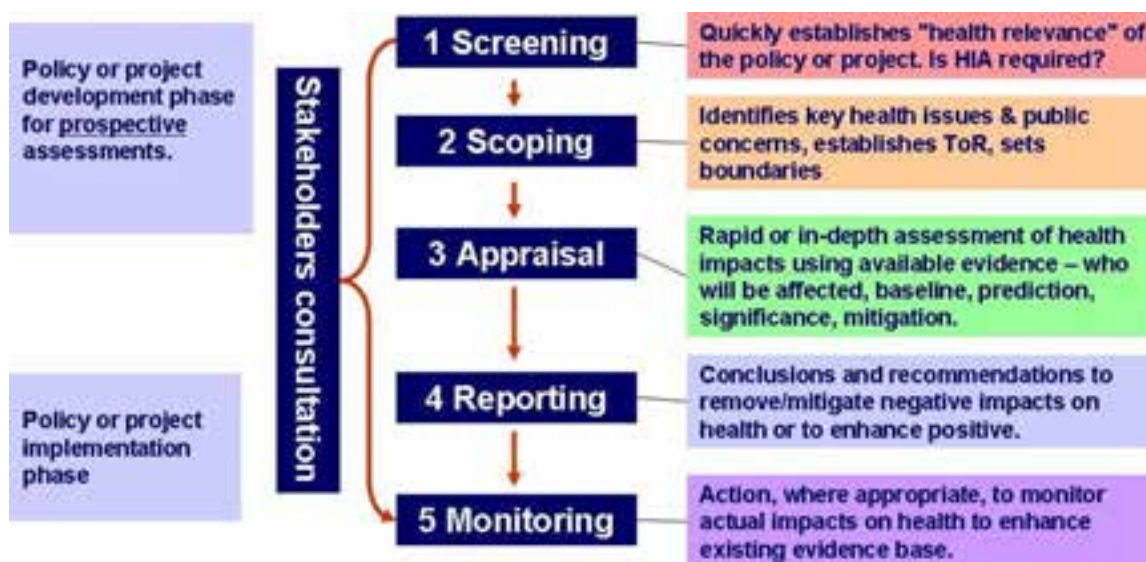
Health impact assessment is a tool used to identify systematically the health implications of a particular policy, plan or project and to recommend actions that will avoid or minimize negative impacts and support or enhance positive ones. Carrying out a health impact assessment in a transparent manner contributes to accountability and communication with local communities and other stakeholders about the anticipated health risks and benefits expected from the project. It is used to identify who would be affected and what is being done to address health problems or enhance health gain.

This chapter briefly introduces the key components of health impact assessment. Because some determinants of health are environmental and others social, there is great value in integrating health impact assessment with other impact assessments (e.g. strategic impact assessment) in order to build on synergies and avoid duplication.

4.1 Overview

Implementation of health impact assessment follows a series of steps similar to those used in environment or social impact assessments. The main steps and associated objectives are set out below.

Fig.2 Basic steps in health impact assessment



Screening identifies if an impact assessment is required or not. It will show if the policy or project under assessment may have consequences for people's health and the extent to which the health impacts need to be assessed.

Scoping defines the way in which the impact assessment will be carried out (the blueprint) and specifies the health impact assessment objectives. The scoping of a policy should describe the context and future scenario options; identify the way in which the policy might affect other relevant policies and plans; identify the main stakeholders to be involved as well as the resources needed to implement the health impact assessment; and define the data required to support the health impact assessment and related decision-making. Scoping at project level

should define the geographical extent of the project, its timeframe, resources involved, the methodology for data collection and stakeholder involvement and a preliminary list of potential health impacts that will need to be investigated.

Appraisal establishes the expected health impacts, both positive and negative. The appraisal will corroborate several sets of information, for example the baseline or community profiling with the policy or project description, the experience gained from impact assessment of similar policies or projects, and the results from stakeholder consultation.

The baseline or community profiling will define and characterize the current health status of the population that is expected to be affected by the policy or project being assessed. If vulnerable groups - present or potentially – are identified, then data should be disaggregated as much as possible. At a minimum, data should be disaggregated for men and women as it is essential to recognize the differential impacts that the project may have on men and women and to propose correct mitigation and enhancement measures. Furthermore, environmental exposure may have a different impact on women than on men because of their different physiology and reproductive systems (Jones et al., 2010).

If knowledge gaps are identified, they will be flagged at this stage and ways to fill them proposed where feasible.

The health impact assessment will use all this information in order to appraise how a policy or a project might generate health impacts on a given community or in a particular context. Health impact assessment uses a broad model of health where impacts can be direct (e.g. injuries from construction activities) or indirect (e.g. change in land availability leading to malnutrition due to reduced access to food). The latter may not be readily apparent. Therefore it is important to assess potential health impacts in a systematic way using a health impact assessment. If vulnerable groups or particular populations have previously been identified, then the possible differential impact of the project on them should be considered. For example, malnutrition arising from reduced food production may be greater among younger siblings or single mothers as these are not powerful groups within a household or a community. Transparency in the identification, ranking and categorization of impacts is essential for the rigour of the health impact assessment.

Reporting develops a set of evidence-based recommendations on how to manage the health impacts identified. As a result, changes in the formulation of policy or the design of the project proposal can be recommended. The recommendations should, as far as possible, be cost effective, culturally and socially acceptable, and feasible. Recommendations generated by the health impact assessment should be organized in a project-level management plan (i.e. as part of the environmental, social and health management plan). This plan should set out in detail how each impact will be managed, who will be responsible, and how the plan will be monitored. Developing a comprehensive management plan (health action plan) that looks at direct and indirect impacts on community health makes it possible to create synergies among different initiatives. For example, investment in primary education for women has a positive health effect not only on children but on the whole family and in the long term will lead to better health practices and poverty reduction. This project-level impact management plan is as important as the project itself.

Monitoring activities ensure that the recommendations are properly included in project management and implementation activities and facilitate the detection of unintended consequences or unpredicted effects. Monitoring should continue throughout the implementation of the project or policy. It is a crucial step of the process and is clearly linked to broader questions of accountability and the responsibilities of the different stakeholders involved in such projects. Furthermore, resources should be made available to assure that monitoring

activities can be carried out in a timely manner. Monitoring results should also be used to influence future decisions on policy or the project itself, including if implementation is not going according to plan.

Stakeholder engagement should be an ongoing activity that is not limited to any that single step. (Often it is limited to the appraisal and reporting steps.) Stakeholder engagement is an essential part of the health impact assessment process and is instrumental in facilitating transparency and communication at all stages of a project's implementation. It helps to identify concerns and vulnerability arising from project activities. It is a source of local data, helps identify preferred intervention measures and contributes to monitoring.

The following points of clarification are of importance in the use of health impact assessment.

4.2 Policy or sector level HIA

The primary value of applying health impact assessment to policy or sector planning process is that it can be used to influence the framework that will regulate all the activities and projects foreseen within a given policy or sector. Some of the wider health impacts associated with development of a policy or sector strategy can be addressed more easily and effectively at the "upstream" or policy level (e.g. modification of health and safety requirements relevant for the a whole sector or industry).

Furthermore, a strategic health impact assessment conducted at national or regional level will generate an overview of existing health issues (baseline), an indication of the probable health issues associated with the policy (future potential changes in health outcomes) and what interventions will be needed to address them.

This strategic overview of health impacts and the development of a corresponding health action plan can then be used to influence greater alignment and synergies between project-level impact management action plans and additional programmes such as corporate social investment activities. (See box below for more on aligning health activities with corporate social responsibility programmes.)

Box 2: Harnessing the health impact management potential of other actors - corporate social responsibility and the potential role of the private sector

Investors and private companies are obliged by national laws and contracts to identify and manage the impacts that may arise from a project. Private companies often are willing to apply higher standards than those required under national law. Most international companies have strong corporate social responsibility objectives and are willing to finance community development programmes. These programmes can target the living conditions of the communities residing close to the project as well as the sustainable development of the region or country where the project is located. There is a trend for corporate social responsibility initiatives to move away from mere philanthropy and increasingly embrace sustainable development approaches as part of their business plan.

In this context, community or public health interventions are cost-effective activities to sponsor. Communities readily support such interventions because the results are often easy to see and may benefit vulnerable groups that would otherwise not benefit from the presence of the project. For example, while men and educated people can find employment in a project, children will not benefit from job opportunities but could benefit from vaccination programmes.

Improving community health will have a range of benefits including better health of the workforce and their families, which in turn leads to reduced absenteeism and improved productivity. It is important to ensure that not only the families of the employees but also the wider community is targeted, otherwise these initiatives will increase inequalities.

For health systems, corporate social responsibility health programmes can provide an important opportunity to expand service coverage. Many examples exist within both the mining and the oil and gas sectors of health initiatives, funded by the private sector, that filled important gaps in health care provision (e.g. malaria treatment and vector control activities).

However, these health and health systems benefits will only be generated when local health authorities and communities are active partners in the design and implementation of the health initiatives and where resources and efforts are aligned with existing local and regional health development needs and priorities. In order to achieve this, it is essential for the project proponent, the health sector and the local communities to agree on which health interventions are most needed and how they should be carried out. When communities are asked by the project proponent to list their priorities for activities to be financed by a social programme, the lists produced do not always reflect the needs of the whole community. Often priorities are identified without a broad understanding of health needs and priorities, leading to development of infrastructure with no thought for running costs or future use. Corporate social responsibility initiatives should be based on a comprehensive health needs assessment. Before decisions are made, therefore, community- and district-level capacity should be built in order to carry out a comprehensive health needs assessment on which requests and social plans can be based. (See Annex 2 for more information about health needs assessments in relation to other health assessments commonly carried out for large-scale development projects.)

Another important consideration for those corporate social responsibility-funded health initiatives designed to fill gaps in health systems is the risk that the system becomes dependent on that initiative for continued coverage of core services (e.g. vaccination activities, procurement of essential medicines and supplies). This raises questions about the sustainability of health activities financed by corporate social responsibility programmes, and the potential impacts on health that might result if funds from that source were no longer available and activities ceased.

Here again, alignment between social investment activities and national and local health and development plans is vital. In order to achieve this, health authorities need to be actively involved in, and enabled to influence, project planning processes related to social investment programmes for community health.

A further advantage of strategic-level health impact assessment is that it allows for consideration of what multiple activities or development in a region will mean for public health and health systems. These cumulative or aggregate impacts can be extremely important for health but often are not detected by the impact assessment undertaken for single projects because the geographical and/or temporal scope of the project frequently is not wide enough. In addition, individual projects are not likely to consider the environmental and social impacts of different types of industries already located in the same area.

For example, an impact assessment of an offshore oil platform that focuses exclusively on the oil platform and does not include its ancillary structures will miss several important community health impacts. The activities associated with building and servicing the platform – creation of the onshore base; expansion or refurbishing of a port; construction of transport corridors to access the base camp; installation or upgrading of power and energy facilities - should be

included in the overall impact assessment as they are an integral part of the project. To the extent feasible, project expansions or subsequent phases of development should also be considered in the initial impact assessment. However, when financial and operational responsibility for the development of each phase rests with different actors, each of whom requires a separate permit to operate, the impact assessment is often limited to each one's component or phase of the overall development plan. This was the case for the environmental impact assessment that was done for the Jubilee Field in Ghana. The scope of that assessment was limited to the first phase of offshore development activities, and did not take into account any of the wider environmental and social effects that could result from subsequent stages of development of the oil fields.

Thailand's Mab Ta Phut development programme is probably that country's biggest industrialization success story. Nonetheless it is currently facing public protest about its environmental and health impacts and the Supreme Administrative Court decided in September 2009 to halt 76 local chemical and industrial projects. These petrochemical and industrial projects at the Mab Ta Phut complex in Rayong mean a constant increase in chemical uses and pollution, which puts local environmental quality under very high pressure. Air pollution and related health impacts, chemical accidents, illegal dumping of hazardous waste and chemical contamination of water resources and food have been the most serious concerns reported in this area. Also, changes in economic, social and demographic structure have had serious consequences for the mental well-being of local residents who live in a state of greater uncertainty, both economic and social. Although each project has undergone an environmental impact assessment, Mab Ta Phut is a good example of the need to look at regional developments from a strategic point of view and to consider the possible interactions among different projects to ensure that cumulative impacts are assessed.

4.3 Project-level HIA

Project-level health impact assessments in the extractive industries are normally conducted by the project proponent. Although primarily about informing decision-making, the use of health impact assessment at project level can provide a number of direct benefits to the project proponent, local and national authorities and potentially affected communities. Examples of benefits include:

4.3.1 For project proponents

- *enhanced compliance with national legal and regulatory requirements.* This includes national requirements for impact assessment as a condition for issuing a permit or licences to operate. In Indonesia the newly approved Environmental Protection and Management Law (Article 22) dated 8 September 2009 that regulates the environmental impact assessment process is an integrated and comprehensive assessment of project impacts which takes into account biological, geophysical/chemical, socioeconomic, cultural and public health aspects. The output of the assessment is an environmental health impact analysis report.
- *access to financial support.* Projects seeking financial support from a number of large commercial banks have to respect a set of 10 principles, called Equator Principles. These apply to all new projects as well as to the expansion or upgrade of an existing facility where changes in scale or scope may have significant new environmental and/or social impacts, or significantly change the nature or degree of an existing impact. The Equator Principles require companies to conduct assessments that take into account the

protection of community health (principle 2) and to comply with International Finance Corporation performance standards for assessments (principle 3).

- *enhanced compliance with industry or international standards.* Oil and gas as well as mining and minerals industry associations consider protection of community health and safety to be an essential operational standard. Both the International Finance Corporation and industry have produced guidelines to assist in the commissioning, conduct and evaluation of project-level health impact assessment. The International Finance Corporation introduced a community health, safety and security performance standard in April 2006. The Equator Principles Financial Institutions (July 2006) and several other development banks, including the European Bank for Reconstruction and Development (in 2009) and the Asian Development Bank (in 2010), have adopted similar requirements. The World Bank too has developed environmental and social performance requirements as a condition for providing finance or technical advice to national governments. In some instances, the inclusion of health (or health impact assessment) may be an explicit requirement in the above types of performance standards. In other cases, the use of health impact assessment can actually help enhance compliance with other impact assessment requirements because of the additional rigour the former can bring to the latter's results. For example, health impact assessment can facilitate the quantification/estimation of human health risk attributable to environmental or social factors.
- *fewer reputational risks and better cost control.* Health impact assessment can be used to identify opportunities to avert unnecessary and preventable risks and expenditures linked to unforeseen health impacts on both the workforce and on nearby communities. This can contribute to managing liability issues and better definition of different roles and responsibilities that can be assumed by stakeholders in order to address relevant project health issues. When mutually agreed, health impact assessment results can help to define the boundaries of government and community expectations of a project and potentially the company's responsibility for community health issues and related liability.
- *facilitated acquisition and maintenance of social licence to operate.* Health impact assessment can be useful in making clear the potential health risks and benefits associated with a given project. The means used in undertaking the health impact assessment (e.g. stakeholder engagement) can facilitate meaningful and effective involvement of potentially affected communities in project planning and in impact management activities. Where health impact assessment helps to increase overall understanding of the issues that matter to different stakeholders, the results can be used to guide communication strategies for effectively managing risks and enhancing positive impact on the health of the population. This clarifies the gains to different stakeholders.
- *ensures a healthy workforce.* The health status of the workforce can affect absenteeism, productivity and overall project performance. Workers and their families are often part of the local community. Diseases can spread easily and can affect both the project workforce and the surrounding community (for example malaria). Health impact assessment can be used to identify where and how the health of workers is related to the health of communities, and it can help identify intervention options that will be of benefit to both.

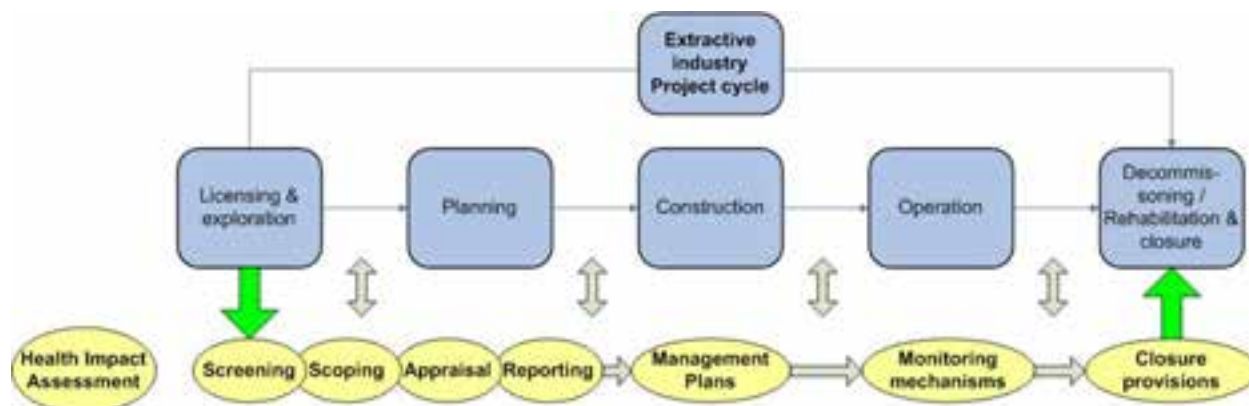
4.3.2 *For governments and potentially affected communities:*

- *Structured mechanism for engagement.* The health impact assessment process can facilitate systematic dialogue between national and local health authorities and communities and will allow stakeholder health concerns to be considered in a structured manner. The use of health impact assessment can also provide a platform ("health as a common interest") for increased cross-sector cooperation between those involved in decision making.
- *Better understanding of potentially affected population groups,* in particular through identifying ways in which the project may have an impact on vulnerable groups, and how the project may exacerbate or diminish health inequities.
- *Baseline of core health and development indicators* against which potential impacts (positive and negative) can be measured, monitored and benchmarked against other similar projects and wider development objectives such as poverty reduction and sustainable development.
- *Avoidance of transfer of costs from the project to the health system or local communities.* The deterioration of health status of a community due to project-related impacts will have important financial consequences for that community because the people affected have to pay the medical care expenses. At the same time, pressure on the health system created by an increase in population size or a change in epidemiological profile due to the project is borne by the health sector. Further benefit can accrue if additional demands to existing health system infrastructure and capacity are anticipated and planned for and boundaries and responsibilities are defined with the company implementing the project.

4.4 **Timing the HIA**

Ideally a health impact assessment should be initiated at the beginning of the policy and planning cycle (see Fig.3 below), as it will provide essential guidance for future activities. If undertaken too late in the planning and decision-making process, the results of the health impact assessment are unlikely to influence key decisions (e.g. policies or project design features) that could effectively reduce adverse impacts on health and/or health determinants. Similarly, the full potential benefits for population health that could result from basic policy or project design changes will not be generated. That being said, health impact assessment can still be undertaken and applied at any point in the resource development and extraction process.

Fig.3 Mapping health impact assessment against the extractive industry project cycle



The difficulty will be that the later in the development of the industry the health impact assessment is undertaken, the less feasible it will be to develop a meaningful baseline of health issues against which to monitor and measure changes in that industry or particular project.

Any health impact assessment carried out at a later stage should have clear objectives. For example, a health impact assessment was carried out for a gas project that had already been operational for several years. The private company responsible for the project had a strong corporate social responsibility agenda and had been investing in community development projects since the inception of the gas project. The development activities, which were carried out by a national nongovernmental organization, were based on the findings of a rapid health needs assessment done before the gas project became operational. However, no baseline health data were collected at the time and after a few years the nongovernmental organization and the private company were unable to monitor the project's impacts on health or to determine if the investment was really making a positive difference to the community. Nor were they sure that the community project was really addressing the most important health needs and impacts. Therefore a health impact assessment was carried out that included an evaluation of the community development projects and a baseline assessment in order to establish health indicators which would enable monitoring and evaluation of the community investment. The health impact assessment concluded that the community programme was addressing the main issues but made important additional recommendations (e.g. to improve links between local procurement and social development and to strengthen the referral system between the health clinics and services built by the project and the national public health system).

4.5 Examples of the value of using HIA for extractive industries projects

The following are some examples of how health impact assessment effectively helped to identify some of the issues outlined above and influenced decision-making processes so as to avert and/or address the problems.

4.5.1 Health impact assessment helped to avoid the introduction of a non-endemic disease

The health impact assessment of a mining project in west Suriname identified a risk of introducing schistosomiasis as a consequence of project activities. This disease is not endemic in west Suriname although it was reported in the coastal areas where most of the construction workers came from. The health impact assessment recommended conducting a vector survey in

order to determine (among other things) if the intermediate host for schistosomiasis was present in the area. If so, the project will have had to ensure that migrant workers were tested and treated before arriving on site and that properly hygienic facilities were available. The introduction of a non-endemic disease in the area would have had a very negative impact associated with the project. Similar concerns regarding onchocerciasis were identified in a health impact assessment of oil exploitation in Ecuador. The disease is present on the coast but not in the Amazon region where the project is located. The risk is that migrant workers or camp followers could reintroduce the parasite in the project area where the vector is already present (YANA CURI).

4.5.2 Health impact assessment helped to empower communities to influence decisions that would affect their health

A health impact assessment was conducted on the extension of an operational opencast mine in Wales. The assessment was initiated by the local community which was concerned that population health was not being given adequate consideration in the planning process. The mine had already been operational for a long time and people in the community felt that their health was being adversely affected. At the time of the health impact assessment there was no statutory requirement for this type of assessment to be undertaken on opencast mining proposals in Wales.

The health impact assessment - a very participatory process as it was initiated and led by the community - was extremely effective in taking into consideration the community's views and in addressing its concerns. The outcome was that the two local authorities involved in the planning decision refused the proposed extension. The health impact assessment was part of the evidence on which the authorities based their decision to refuse. The company appealed against the decision to the Welsh Ministers but the Ministers upheld the decision taken by the local authorities.

Another important outcome of this exercise was a stronger commitment by the Welsh Assembly to a sustainable environment. To support this, the Welsh Assembly Government published the *Minerals Technical Advice Note 2: Coal* that provides advice for local planning authorities, applicants and other stakeholders and applies to both surface (opencast) and underground coal mining. The Advice Note suggests that the potential impacts on human health of planning applications for coal mining should be considered in a health impact assessment to be carried out as part of the broader environmental impact assessment.¹

4.5.3 Health impact assessment helped to increase women's role and benefits from the project

A health impact assessment of a mining project was carried out in a sparsely populated tribal area of Pakistan. The assessment identified substantial gender inequality in terms of influence and well-being. Women's relative lack of power was manifested and affected them in two interlinked ways: economically, as they were less likely to be employed; and socially, as their position in the consultation and decision-making process was weak. Hence the project could have had a disproportionate negative impact on women.

The health impact assessment recommended, among other things, ensuring that the company team in charge of community consultation and development was gender balanced and able to involve women in the planning process. (At the time of the assessment the team was composed exclusively of men.) The assessment also recommended supporting education facilities, scholarship and vocational training activities that specifically targeted women. Further, it

¹ (Available at: <http://wales.gov.uk/topics/planning/policy/mineralstans/2877461/?lang=en>)

supported the recruitment of a woman to be the medical doctor in charge of the local clinic (at the time of the health impact assessment, the doctor was a man who, according to the local culture, could not examine female patients). The mining company was already aware of the gender dynamics and had a very proactive gender policy which made the development and implementation of recommendations much easier.

4.5.4 Health impact assessment engaged local health authorities in project-level health monitoring activities, an example from a mining project in Madagascar

An environmental impact assessment undertaken on a mining project in Madagascar, identified HIV and sexually transmitted infections as a potential negative impact of the project. A monitoring system was developed, based on data from the health authorities. However, at the time when the impact assessment was conducted, no formal agreement existed between project and health authorities and therefore no monitoring activities were really carried out.

The project proponent later undertook a health impact assessment. This health impact assessment was supervised by a steering group that brought together the project proponent, the regional and district health authorities, a civil society representative and the health impact assessment team leader. The presence of health authorities in the steering group increased their motivation and encouraged their participation in the health management plan. One immediate result of this greater participation was the development of a data sharing system between the project proponent and the health authorities.

5. Systems for managing and monitoring public health impacts

The systems used to manage and monitor the health impacts associated with a project and the actions taken to address them are essential to the entire impact management system. It is at this point - when project activities begin and implementation of the recommendations and their related monitoring activities are initiated - that the overall impact management framework is tested and risks breaking down.

The following section describes some of the elements and individual systems that can be used to manage health impacts that may occur during the implementation of extractive industries' project, drawing on experience gained in using such systems.

5.1 Health management plans

The result of the health impact assessment process is the development of a health management plan. In some cases this plan may be developed separately or it may be integrated into the wider environmental, social and health management plan.

As health impact assessment is most often undertaken at individual project level and by the project proponent, the resulting health management plan is often limited to the responsibilities and actions of that project operator. However, the project proponent is not and should not be solely responsible for the implementation of the health management plan. Local and national authorities and communities have a role to play in contributing to the management plan and in the execution of certain activities. The extent to which project-level health management plans actively incorporate the actions, roles and responsibilities of other actors can vary. This is due to the commissioning role of the project proponent as well as the tendency to work in a vertical and non-collaborative way. For many private companies it is easier to have control over a defined set of recommendations if they do not have to interact with governmental or local agencies. However, issues concerning community health require strong collaboration with the health sector in order to be managed properly. Certain actions will be the responsibility of the project proponent, while others will be a task of the health sector. Health authorities need to be

enabled to carry out these additional tasks, including through adequate allocation of resources (technical, human and financial).

The health impact assessment of a mining project in the Democratic Republic of Congo resulted in the signing of a Memorandum of Understanding between the mining company and the regional health authorities. The Memorandum of Understanding served as the general framework for implementing the health management plan and clearly specified the responsibilities of each party. Thus while the mining company was responsible for the construction and refurbishment of health facilities, the health authorities were responsible for procurement of medicines and supplies and for staffing. These health care facilities were already part of the national health plan to revitalize the health districts but the health authorities did not have sufficient resources for construction and staffing. This project is a clear example of following national guidelines and of a mining company supporting community health in collaboration with the health authorities. The Memorandum of Understanding also specified the frequency of coordination meetings, the monitoring and reporting system, and the timing for future revisions. It was used also to deal jointly with unforeseen emergencies such as an outbreak of cholera which occurred in the district.

The development of a health management plan is an essential step in the process of managing health impacts as it outlines very clearly

- priority health risks that will be managed and monitored;
- interventions that will be put in place to prevent or mitigate negative health outcomes and promote health enhancement;
- who will be responsible for the implementation of the above interventions, when these activities need to be implemented and who will fund them, if additional technical assistance is required;
- what will happen in case of unforeseen events.

The health management plan also provides the basic framework for monitoring project or development activity related health impacts and the results of actions taken to address them. (See section 5.3 for more information on this.)

The health management plan deals with managing the impacts associated with each phase of the project cycle, i.e. construction, operation and decommissioning. As the project moves into these different stages, the plan should be reviewed regularly in order to ensure that it remains relevant, that the impacts are properly managed (if unintended impacts are emerging) and that responsibility is properly assigned. As was seen in the Chad-Cameroon case example, lack of flexibility in the environmental management plan, coupled with the unsatisfactory scoping of the project's potential health footprint, significantly undermined the effectiveness of the intervention packages and gave rise to response mechanisms that proved inadequate in the face of problems that emerged.

The health actions included in the health management plan should be carefully selected and should be

- consistent with national health policies;
- implementable;
- evidence-based, including taking into account local evidence for feasibility;
- socially and culturally appropriate to the local environment and acceptable to the community;
- cost effective.

5.2 Emergency preparedness and response plans

Because of its potential environmental, social and health impacts, an essential component of any extractive industry project is the emergency preparedness and response plan. An emergency is an unplanned event that can be either a natural disaster that affects project infrastructure and surrounding communities (e.g. a mudslide due to heavy rain) or a man-made incident (e.g. an oil spill or a leakage from a tailing dam that may pose risks to human health or the environment). The plan should provide guidelines on the measures needed to contain and minimize the risks. The key is to ensure that adequate linkages are made between environmental protection and response systems, and relevant sector and local authorities, including public health emergency response systems. Often these plans are developed by the technical project staff but are not shared with the relevant authorities. If drill exercises are carried out, the local communities are only minimally involved. This approach undermines the effectiveness and efficiency of these plans.

Emergency preparedness and response plans in reality often consist of multiple plans developed in isolation (e.g. the facility-based plan, the off-site plan, the national disaster response plan, the mass casualty response plan) without taking into account the linkages and relationships between them.

Table 3 outlines some of the key health-related questions to be considered when developing project- or sector-based emergency preparedness and response plans.

Table 3: Linking project level and sector level emergency preparedness and response plans with public health emergency preparedness and response plans

Key questions	Examples; details to look for
Does the plan link with existing national and local emergency response plans?	To be considered with respect to availability of human resources and qualified personnel; coordination mechanisms; community evacuation procedures, and training and test procedures
Are there any links with national/international early warning and surveillance systems?	For example, as part of early detection and response to an emergency or incident, as well as in relation to incident reporting (e.g. for chemical incidents)
Does the plan rely upon, or provide support for the use of, national and international emergency preparedness and response infrastructure or services?	For example, in relation to the use of poison centres and laboratories; links with national and international institutions (WHO, IAEA) and networks such as REMPAN (radiation emergencies) and CHEMINET (chemical emergencies)

Key questions	Examples; details to look for
<p>Is there specificity about public health aspects of emergency preparedness and response, and the extent to which local capacity exists to handle an event?</p>	<p>For example, did the emergency preparedness and response plan take into account</p> <ul style="list-style-type: none"> - whether there is sufficient capacity of local institutions (e.g. hospitals) to handle an event commensurate with potential risk posed by project? - whether health care facilities are potentially exposed to spills, flooding through dike rupture, explosion, air pollution ? - whether there is a structure for intersectoral collaboration during response to an emergency, and what role or linkages will be made with the project emergency preparedness and response plan? - who will handle health crisis communication and linkages with local government authorities and how this will be done?

5.3 Monitoring and surveillance systems

Monitoring and surveillance is essential if the health sector is to respond (or activate a response by others) to challenges posed by natural resource extraction activities. Key objectives of a health impact monitoring and surveillance system are to:

- detect changes in health outcomes that might result from the introduction of the project or sector activity;
- enable the timely recognition and response (action) to address the above health impacts;
- facilitate the measurement of those overall changes in the health status of the population associated with the development of the project, sector activity, or industry;
- facilitate monitoring of implementation of the measures outlined in the impact management plan (compliance monitoring).

In order for this monitoring and reporting to be effective, it must be compared with adequate baseline information of health conditions. This health baseline is the critical reference point against which to monitor and measure changes attributed to the project, industry or sector's development. As described earlier, community health baseline information is a key output of the health impact assessment process.

This baseline must be generated using up-to-date and accurate data about the existing health status of the population. The information and data used (and the resulting baseline itself) need to provide a complete picture of the health status of the affected population(s).

Firstly, the quality and relevance of the data used needs to be appropriate. In the case of the Chad-Cameroon project, problems with the completeness and quality of local health information/data undermined the integrity of the health impact assessment and health management plans. The oil consortium decided against doing any baseline studies that would generate new health data, so existing/secondary data (much of which was generated in 1970s) was used. The lack of accurate up-to-date information compromised efforts to prioritize and target intervention measures effectively, and virtually eliminated the possibility of measuring the eventual impact (and performance) of the project on health (Singer, 2004) and on key poverty and development indicators (e.g. maternal and child mortality).

Secondly, the data and information used for the baseline, the targeting of health interventions and eventual monitoring activities also need to provide a complete picture of what is happening in a given population. Multiple sources of health data/information are often needed in order to have this complete picture.

Routine health data (e.g. collected at health centres) can be very useful, provided it is of an appropriate level of specificity and the period covered is relevant to the monitoring efforts. However, routine health data may only provide information about health issues that are presented at health care facilities. It will not provide information about those who treat themselves or rely on traditional medicine.

Routine health data - for example, data related to health issues such as chemical poisoning - may not have the required level of specificity and sensitivity. There may be important gaps in routine information collected: the data may be aggregated at a level which is not useful for local level monitoring activities or the system may not be able to detect key health issues that could arise. For example, chemical poisoning with cyanide and/or mercury is commonly associated with artisanal and small-scale mining activities. The oil and gas industry uses and produces a range of chemical by-products which can be harmful to human health. If the case definition for poisoning in the country in which these natural resource extraction activities are taking place does not have a health incident reporting system that can distinguish between sources and types of poisoning, it will be impossible to know whether or not populations are being affected by chemicals associated with the respective industrial activities. This was an issue identified in Ghana during a review undertaken to develop a surveillance system for pesticides poisoning. Ghana has a large mining sector and is now about to develop a new oil and gas industry. The current case definition for poisoning is general and data generated would not inform treatment protocols, nor would it give any indication as to the source of exposure. As a result of the review, Ghana is now adapting the poison case definitions that will be used for reporting poisoning incidents.

In order to have an accurate picture of the health and well-being of potentially affected populations, it may be necessary to establish a multilayered early warning system (i.e. one that draws on informal and formal sources of data such as communicable disease surveillance systems) that is managed and reported by different actors such as local police, civil protection authorities and municipal authorities responsible for environmental monitoring, water, waste collection, power and traffic and transport.

Proxy indicators can also be used to develop an early warning system that could detect environmental, social and institutional changes known to have significant negative impacts on the health of communities. Some examples of proxy indicators that could be used as part of a sector-level early warning system that could complement existing health monitoring systems are provided in Table 4 below.

Table 4: Sample indicators for monitoring health impacts

Health determinant	Proxy indicator	Source of data/information	Associated potential health impact/outcome
Access to jobs, income, technical training	Number of new jobs by category	Ad hoc surveys; company data	Improved access to food, housing, transport, etc.
Access to food, food security	Market price of basic food items (e.g. bread, rice or other household staples)	Ad hoc surveys	Malnutrition, anaemia, low birth weights
Access to housing; loss of land (e.g. due to rapid property sales and development)	Price of rent; property prices	Ad hoc surveys; media/newspapers (classified advertisements)	Decreased household/individual income and related potential for spending on health care, food and other basic necessities
Access to (availability of) safe drinking water	Fluctuations in water supply; drinking water quality	Municipal/local water authorities	Diahorreal diseases, cholera, chemical poisonings.
Access to and availability of safe food	Hygiene conditions in markets (e.g. storage, handling and preparation of food)	Ad hoc survey	Zoonotic and food borne diseases
Mobility, access to transport	Change in cost of transport (e.g. bus fares); changes in safety of travel for both passengers and bystanders (pedestrians, bicyclists)	Ad hoc surveys	Implications for access to health care, employment and social cohesion (seeing friends and family)
Access to civil protection, security	Crime rates; incidence of violence (interpersonal, domestic); traffic accidents including fatalities	Local police	Injury, death, disability; stress, individual or community mental well-being (e.g. associated with unrest)

Health determinant	Proxy indicator	Source of data/information	Associated potential health impact/outcome
Access to health and basic services	Health care utilization rates; availability of basic medicines in pharmacies	Health care facilities; national health statistics	Health care seeking behaviour

Although indirect or proxy indicators are not often sufficiently robust to use in targeting specific disease interventions, they can provide useful intelligence about wider social and environmental changes taking place that can have important implications for health. Such changes can indicate when and where additional, or more detailed, health information or analyses may be needed.

It is assumed that the health sector would be able to maintain such an early warning system on its own, especially since these activities would need to take place predominantly at the local or regional level where resources are most likely to be limited. The above table endeavours to illustrate how and where health information and data could feed into a wider impact monitoring framework.

The effective use of the above early warning and other disease surveillance systems will depend on when they are put in place. Delays can occur between the commencement of project activities and the development and implementation of impact management and monitoring systems. During that period, the impact alert and detection systems are not yet fully functional and so cannot capture the information needed to monitor for unforeseen impacts associated with the project. Here again, the timing of the health impact assessment is pivotal: it needs to be done early enough so that systems likely to be needed can be identified and adequately tested and refined before they are actually needed.

Table 5 provides some suggested reporting schedules for health monitoring activities.

Table 5: Suggested reporting schedules for the health management plan

Level of indicator	Recommended frequency of reporting	Examples of data collection methods used
Input/Process	Continuously	Health services statistics, health facility monthly reports Health facility surveys Mobile clinic monthly reports Programme monitoring

Level of indicator	Recommended frequency of reporting	Examples of data collection methods used
Output	Quarterly, biannually, or annually	Health services statistics, health facility monthly reports Health Zone annual report Mobile clinic monthly reports Health facility surveys Programme monitoring Emergency preparedness (including drills and liaison with project managers)
Impact	2-5 years	Surveillance Mobile clinic annual reports Annual seroprevalence survey in school children Interim health survey (compared with a baseline household level survey), including contaminants levels in human fluids. Final Evaluation Health Survey

5.3.1 *Monitoring the results of health interventions*

Health management plans or integrated environmental management plans should have a core set of performance indicators built into them. These indicators - often process or output based indicators (e.g. number of bed nets distributed, number of training events conducted) - are essential for performance and compliance monitoring. They will reveal to what extent the stated interventions have been delivered and, when combined with an analysis of health outcomes, can reveal what result was generated.

Monitoring implementation and results of health or integrated environmental and social management plans is another point where the overall impact management system tends to break down. For this reason, some projects adopt multilayered monitoring systems. However, in order for these systems to be effective, they need to be able to influence changes in the management plan (for example to modify interventions being delivered). They also need to be able to enforce compliance on delivering the actions outlined in that plan. This was a key lesson learned from the Chad-Cameroon project. Neither of the external compliance monitoring groups had any power to enforce project compliance with the environmental management plans, or to require changes to project implementation plans when adverse environmental, social or health issues started to emerge. Many of the recommendations made as a result of performance monitoring activities were never acted upon. According to one reviewer of the Chad-Cameroon experience, the oversight committee charged with performance and compliance monitoring "must have the highest level of enforcement power in the event that the subcontractors fail to comply with the health impact assessment action plan during any phase of the project. Enforcement mechanisms could range from fines to temporarily halting development activities until the subcontractor achieves compliance." (Singer et al., 2004).

There is additional value associated with investment in health performance monitoring systems apart from compliance monitoring, including in the context of corporate social responsibility investment activities. Where results are positive (there are improvements in health status) these results can be reported as part of the benefits generated by the project.

Box 3 : The importance of comprehensive monitoring - example of acid mine drainage

Acid mine drainage is a big problem for the mining industry and resident communities. Acid mine drainage occurs when sulfides in rocks are exposed to air and water and are transformed into sulfuric acid. This transformation is a natural process. However, mining activities exponentially boost the process by producing large quantities of wasted rock, either from the opening up of underground mines or by increasing the rock surface through excavated open pit mining. Acid is carried off the mine site by rain water or surface drainage and deposited in nearby streams, rivers, lakes and groundwater. Furthermore extraction activities decrease groundwater depth and its natural filtration capacity, which in turn increases groundwater contamination. Acid mine drainage severely degrades water quality, can kill aquatic life and make even large bodies of water virtually unusable. Once started, acid mine drainage can continue for centuries.

While treatment systems have been developed, preventing acid mine draining is by far the preferable option although not an easy or cheap one. Often acid mine drainage cannot be accurately predicted and therefore monitoring is even more necessary.² In a study of mines in the United States of America, nearly all (eight out of nine) mines that developed acid drainage had either underestimated or ignored the potential for acid drainage in their environmental impact statement. Several other mines had failures in the mitigation measures they claimed would prevent or limit acid mine drainage.³

² http://energy.er.usgs.gov/health_environment/acid_mine_drainage/

³ <http://www.earthworksaction.org/pubs/ComparisonsReportFinal.pdf>

6. Institutionalizing the use of health impact management systems

In most countries the protection of the health and welfare of the general public is the responsibility of the government, through its national health system. This enables the government to pass legislation that protects personal health and welfare and to regulate activities that could be detrimental to general health and welfare. The health system should play a stewardship role by influencing policies that can benefit health and fostering organizational arrangements in order to include health considerations and protection in all other sectors. This is particularly relevant in order to address adequately those health issues related to extractive industries' activities.

The World Health Organization (World Health Report, 2008; resolution WHA62.12) recognizes stewardship as a core function of the health system and the very essence of health governance. Stewardship has been characterized as

- generating intelligence;
- formulating strategic policy direction;
- ensuring tools for implementation (powers, incentives and sanctions);
- building coalitions and partnerships;
- ensuring a fit between policy objectives and organizational structure and culture;
- ensuring accountability (Travis et al., 2001).

In order to assure the inclusion of health considerations in other policies and sectors, the health system needs to exercise its stewardship and set up a system that can aid implementation of stewardship tasks. This section briefly describes the key elements for doing that.

6.1 Policy or framework for integrating health into sector decisions

It is important to be clear about how health can be integrated into other sectors' planning. A policy should be in place that establishes the mandate to look at health issues in the context of planning processes, along with regulatory requirements concerning where and when to consider health issues. Roles and responsibilities of each party involved should also be clearly defined within this policy or framework. This is being done successfully in Canada and Thailand, for example, through national level policies such as the National Health Act (Thailand, 2007) and the Public Health Act (Province of Quebec, 2002). In other countries (e.g. the United Kingdom of Great Britain and Northern Ireland, New Zealand, Australia), requirements for integrating health into sector policies are linked to impact assessment and planning procedures and requirements.

A number of other considerations and enabling factors also play a role. For example, the success of integration will be determined by the way in which health and/or environment is defined. (It is essential to have a broad definition of health and to include all determinants including social, environmental and institutional factors.)

Successful policies define the role and tasks of the health sector, thus determining its degree of power to influence the decision-making process in favour of health.

Clarification of human and financial resources are crucial for successful implementation of health impact assessment, of health and other management plans and of monitoring systems.

6.2 Mechanisms for engaging with different stakeholder groups

Engagement between sectors or with other government actors, industry, civil society, communities and vulnerable population groups, as well as with the general public (health impacts can be apparent to non-experts) is a key pillar of the institutionalization of health impact management systems.

Key elements that enable meaningful engagement include: establishment or strengthening of public and community participation processes; access to information, including about potential health, environmental and social impacts, mitigation measures and results of monitoring activities; free and informed mass media communication; and mechanisms for dealing with grievances (e.g. through an ombudsperson).

Stakeholder engagement mechanisms cannot be limited to the planning or assessment period but must function throughout the duration of the policy or project.

Robust mechanisms for engaging with stakeholders and strong communication skills are needed in order to respond adequately to health concerns.

Long-term funding for the decommissioning phase should be provided through some form of financial security deposits in order to cover at least part of the cost associated with meeting the decommissioning conditions that were identified in the approval for each site. These may include long-term follow-up of population health indicators. The intention is to ensure that sufficient funds are available so that national and regional authorities can undertake the necessary decommissioning activities in the event that it proves impossible for operators to do so (as a result of a bankruptcy, for example).

Box 4: Engaging communities in the HIA process - example from Thailand

Community-based training is one of the key means used to strengthen community engagement in the health impact assessment process in Thailand. Workshops are organized so that community members can learn about the health impact assessment process, how to be involved in it, how to set the scope of a community health impact assessment, how to collect health data by themselves (digital camera is one of the popular tools) and how to review a health impact assessment report. Applied learning is used as the main teaching strategy. In one workshop, for example, community members were given an exercise that calculated the total community monthly income earned from collecting bamboo shoots in the public forest in the area where a development project was being planned. The participants, very surprised at these results, were able to develop a better understanding of the ways that the development project could impact on their livelihoods and through that on their health and well-being.

6.3 Guidelines or operational procedures

Clear guidelines or operational procedures should:

- define the role of each actor involved in the process;
- describe standard operating procedures for all phases in the health assessment, management and monitoring processes;
- describe how stakeholder engagement and community participation would take place;
- make clear the roles and responsibilities of, as well as operating procedures for, different actors including national and local health authorities and those from other sectors (e.g. energy, environment, minerals and resources).

Box 5: Formalizing stakeholder engagement in the HIA process - example from Thailand

The National Health Commission, established under the National Health Act 2007, emphasized the importance of stakeholder engagement in the health impact assessment process by putting in place a regulatory requirement for public involvement in the health impact assessment scoping process and in the review of the health impact assessment report. The requirements include a set of minimum procedures which must be adhered to as part of stakeholder engagement.

The health sector may contribute to either a health impact assessment or an integrated impact assessment by:

- assisting in the screening and scoping of project options;
- drawing up and/or influencing the impact assessment terms of reference;
- reviewing and commenting on impact assessment reports;
- preparing an intersectoral action plan for health, including a framework for action (e.g. Memorandum of Understanding);
- preparing a solid evidence-based position for negotiations;
- monitoring compliance with the recommended measures;
- monitoring the health status of local communities;
- preparing an earmarked budget for project-related activities.

6.4 Institutional structures and capacities

Leadership, technical support, analysis and research capacity are key ingredients for successful institutionalization of health impact management systems. Dedicated structures, units or persons that will act as focal points are also needed. These functions will need to have adequate resources, both technical (as in human resource capacity) and financial. Examples of such dedicated elements include:

- A central focal point (e.g. dedicated unit) that handles all queries and requests for information concerning procedural and regulatory issues; coordinates the engagement of health sector at appropriate levels and coordinates responses to complaints;
- an intersectoral task force, working group or advisory committee;
- a dedicated institution (e.g. national university) that provides technical support (e.g. consultants) for assessment of health issues, supports monitoring, research and surveillance activities and provides further training and capacity development.

For example, the development of health impact assessment in Thailand was led by the Health Systems Research Institute which examined international experience and practice, piloted health impact assessments in Thailand and developed capacity to implement and analyse health impact assessment practice and propose improvements. The role of this centre of expertise continued to evolve following the implementation of national health impact assessment legislation.

6.5 Monitoring and reporting mechanisms

The monitoring and reporting of health impacts and health management plan implementation requires an understanding of the baseline health status of the populations affected, as well as knowledge of the health information resources existing in the affected area. Coordinating data sources is important for efficiency and for connecting them to local and national health information and priority-setting efforts.

A community health profile can provide an accurate baseline of health and social issues before the development policy or project goes ahead. This is crucial for any efforts aimed at monitoring and responding to unforeseen changes in health status (early warning and response) and measuring overall social (health) performance of the development project/or sector activity.

6.6 Mechanisms for continuous learning and capacity development

These may include, for example, the establishment of a training institution that would teach how to use tools such as health impact assessment. This could be done as part of educational modules (e.g. within public health or environmental management degree programmes) or by offering training courses to develop a local pool of qualified technical consultants. Furthermore, it would allow learning and case examples to be documented.

Different approaches can be taken to foster continuous capacity development. For example in New Zealand the Government established a learning-by-doing fund. A dedicated support unit was set up within the Ministry of Health, and provided technical support and funding to regional and local level health authorities to undertake health impact assessment.

Access to health impact assessment process and results are crucial in order to learn from practice and experience. The majority of health impact assessments carried out for extractive industries' projects are either not disseminated or not in the public domain (possibly because there are no requirements to disclose health impact assessments, although that is current practice for environmental impact assessments). The disclosure of health impact assessment process and results is an essential requirement for institutionalizing health impact management systems, because capacity development (learning from experience) and access to information form the basis of quality assurance for health impact management systems.

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Annex 1 Definition of terms and glossary

Full-scale health impact assessment	Often entails collecting new data. It may include a survey of local residents and/or a comprehensive literature review of primary studies of health effects carried out for similar projects elsewhere. Such as assessment usually requires a prolonged and substantial time commitment from a number of people and is resource intensive.
Rapid health impact assessment	Uses information and evidence that is already available or easily accessible. A rapid health impact assessment can be carried out as a participatory or a desk-based, non-participatory process.
Health needs assessment	<p>Generally looks at health issues independent of a project, unlike a health impact assessment which looks at health issues linked to and potentially affected by a project.</p> <p>Many large-scale development investment projects have a separate budget for social or community development. This budget may be used to address community health needs that are not necessarily associated with the project. A health needs assessment is often conducted as part of the basis for designing a community development or investment plan.</p> <p>The health impact assessment may overlap and provide input to the health needs assessment by identifying pre-existing priority health issues (e.g. as part of baseline studies). However, the overall focus and purpose of health needs assessment is very different from health impact assessment as the former is used primarily to develop corporate social responsibility programmes.</p>
Health risk assessment as used in extractive industries	Generally considers workers' health and safety issues including the engineering risks of infrastructure. Health risk assessment is focused on the identification of potential threats to health that may occur "inside the fence" and in the workplace, whereas health impact assessment is primarily concerned with the assessment of a project's potential health impacts "outside the fence". Some of the issues considered may overlap, for example in relation to the injury potential of project infrastructure. However, the two types of assessment examine the risk from different angles (i.e. in relation to different "receptor" groups).
Health risk assessment as used in public health	The quantitative estimation of impacts on health based on hazard and human exposure to that hazard, and health impacts based on dose-response relationships derived from epidemiological studies.

Health	A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (World Health Organization, 1948).
Health impact	Exposure to health determinants, risks to health and a resulting change in health status attributed to a project.
Health determinants	The range of personal (including genetic), social, behavioural, economic, institutional (e.g. access to health services), and environmental factors that determine the health status of individuals or populations.
Health hazard	An agent with a potential to create ill health (e.g., bacteria, toxins, chemicals).
Hazard	The intrinsic capacity of an agent, a condition, or a situation to produce adverse health or environmental effects. One should consider safety hazards, health hazards and environmental hazards.
Health outcome	A change in the health status of an individual, group or population that is attributable to a planned intervention or series of interventions, regardless of whether such an intervention was intended to change health status.
Health risk	A measure of likelihood that an identified hazard will cause harm to a particular group of people at a particular time and place.
Health status	The current state of an individual's health including mental and physical well-being, and any underlying diseases or injuries.
Stakeholders	All those who have rights or interests in the project and/or are affected directly or indirectly by it. Stakeholders can be individuals, communities, social groups, project representatives, organizations, or administrative bodies.

Annex 2 Artisanal and small-scale mining and associated public health issues

One of the most commonly observed induced impacts of large mining projects is the influx of artisanal or small-scale miners to the region. Artisanal and small-scale mining is a form of subsistence mining that is labour intensive and utilizes rudimentary extraction techniques. More than 100 million people throughout the developing world depend directly or indirectly on such mining for their livelihood. (ILO estimates 2010; ICMM 2010 - web site). In many parts of the world, artisanal and small-scale mining is at least as important as large-scale mining activities, particularly in terms of the numbers of people employed (International Council of Mining and Metals, 2003).

Following the discovery of new mineral deposits and the establishment of large-scale, formal mining operations, an opportunistic in-migration of artisanal or small-scale miners often occurs. (ICMM, 2009/10). As artisanal or small scale miners are often seasonal or temporary workers, many lack geologic exploration skills and thus depend on the technology of large-scale mining companies to discover mineral deposits.

The migration of artisanal and small-scale miners to a large-scale mining area may occur with such rapidity that it quickly overwhelms existing populations and local resources, especially in rural, remote, and/or underdeveloped areas. For example, prior to the existence of the Sadiola Gold Mine (Mali), the local population living in the area totalled 850. Two years later, the population had grown to 3850 and 8 years after that, the population was 10 000. (International Finance Corporation, 2009). In Mongolia, the establishment of large-scale mining projects spurred an artisanal and small-scale gold mining boom throughout the nation. Opening its borders to international mining firms in the late 1990s, the population of artisanal and small-scale miners soared from close to zero in 1998 to more than 100 000 in 2006, employing approximately one fifth of the rural population. In 2004, the implementation of a large-scale mining project in the southern Gobi Desert region resulted in the in-migration of thousands of artisanal and small-scale miners to a remote and previously uninhabited area (Appel, 2003).

Similarly, in Myanmar, large-scale mining has propagated and enabled the migration of thousands of artisanal and small-scale miners to the Monywa Mine where they carry out a dangerous method of copper extraction (known as *dohtar*) directly from the tailings of the large-scale formal mine. The link between the establishment of large-scale mining endeavours and migration of artisanal and small-scale miners has become increasing evident in Myanmar, where it is said that most formal mines quickly develop an “artisanal shadow” (Smith, 2007).

Frequently, male miners arrive first and set up squatter camps near exposed mine workings. In many cases these squatter camps lack basic amenities and services (e.g. water, electricity) and have conditions that are ripe for the spread of infectious diseases. Over time, these squatter camps can evolve into more permanent ones. Most often, small scale miners exploit minor deposits in the vicinity of the large-scale mine or the previously mined tailings that have been discarded and are commercially worthless to the large-scale mine. In this way, large-scale mining companies often provide the medium from which artisanal or small-scale miners can extract the remaining mineral wealth. Unfortunately, the scavenging of tailings often exposes individuals to large amounts of toxic chemicals that pose a direct threat to human health and the environment.

Key public health issues associated with artisanal and small-scale mining

Environmental pollution and degradation Artisanal and small-scale mining activities may directly pollute and damage rivers and waterways as a result of increased sedimentation, erosion and acid rock drainage. Airborne emissions from artisanal and small-scale mining operations, including the vaporization of hazardous chemicals, generation of dust, and pollutants emanating from roasting of ores, result in significant atmospheric pollution. For example, it is estimated that artisanal gold mining activities produce 400 metric tonnes of atmospheric mercury emissions per year (Veiga & Telmer, 2009). Toxic chemicals utilized in artisanal and small-scale mining, such as mercury and cyanide, are rarely recycled and are disposed of in the surrounding environment. As much as 95% of the mercury used in artisanal and small-scale mining is released after use, accounting for one third of global mercury pollution. In the environment, these toxicants can pollute distant waterways and bio-accumulate in the food chain, resulting in a persistent hazard for human health. Compared to the highly mechanized technology of large-scale mines, artisanal and small-scale mining commonly releases higher levels of toxic chemicals due to the rudimentary practice of mercury and cyanide amalgamation. Due to a lack of formal approval to mine a specific region, artisanal and small-scale mining may occur in protected environmental areas. Following the discovery of significant gold deposits in the southern Gobi region of Mongolia, an influx of artisanal and small-scale miners settled and mined in protected government areas that large-scale mines did not have access to due to licensing agreements (Appel, 2003).

Chemical poisoning Artisanal and small-scale miners worldwide utilize toxic chemicals (e.g. mercury and cyanide for gold; sulfuric acid for copper) in the extraction process, due in part to the low cost and effectiveness of this rudimentary process, as environmental and health costs are never factored into the equation. Moreover, chemical extraction is an effective method of extracting minerals for artisanal or small-scale miners working from the tailings left behind from large-scale mines. Mercury (utilized in gold extraction) is a potent neurotoxicant that causes tremors and muscle atrophy at low doses of exposure and kidney disorders, respiratory problems and death if exposure levels are high. Mercury intoxications and poisonings are commonly reported in artisanal and small-scale gold mining worldwide. A United Nations Environmental Program (UNEP) research team has documented levels of mercury intoxication from inhalation exposures that sometimes exceeded 50 times the World Health Organization's maximum public exposure limit. At one specific UNEP project site, almost 50% of miners showed an unintentional tremor, a typical symptom for mercury-induced damage of the central nervous system (UNEP, 2007) which is usually permanent. A lack of personal protective equipment and knowledge of safe handling practices exacerbates health effects induced by chemical exposure, particularly for vulnerable populations such as women and children for whom congenital anomalies and brain damage are likely to be the consequences.

Occupational health and safety issues Fatality rates associated with artisanal and small-scale mining are estimated to be 90 times higher than in large-scale mining operations (International Council of Mining and Metals, 2010; Hinton, 2007), which are recognized to belong to the highest risk category among heavy industries. Injuries and deaths are due to unsafe working conditions, lack of appropriate tools and equipment including personal protective equipment, lack of health and safety regulation of artisanal and small-scale mining activities, and lack of awareness (e.g. of health risks) and technical expertise (e.g. related to mining engineering) among artisanal and small-scale miners (International Council of Mining and Metals, 2010). Other occupational health issues associated with artisanal and small-scale mining include silicosis, noise-induced hearing loss, and ergonomic injuries (e.g. associated with heavy lifting) (ILO 2010, International Council of Mining and Metals, 2010).

Crime and/or violence occurs as a result of rapid in-migration of artisanal and small-scale miners which overwhelms existing legal or traditional security structures in communities. In regions where artisanal and small-scale mining is illegal, the absence of police and a formal legal structure results in high crime rates and incidence of rape and violence. For example, rampant violence occurs in the Madre de Dios gold mining region of Peru where lawlessness propagates criminal activity (Kuramoto, 2001). artisanal and small-scale mining is also commonly associated with substance abuse and alcoholism - common risk factors for violence and/or criminal activity. Extensive research has demonstrated that unlawful activities (e.g. crime, rape, drug use) are more prevalent in artisanal and small-scale mining communities that are rapidly created in a mining "rush" (Hinton, Veiga & Beinhoff, 2003).

Sexually transmitted diseases Prostitution is common, especially in male squatter camps, as is increased prevalence of HIV/AIDS and sexually transmitted diseases.

Spread of water-borne diseases Still water from mining activity may propagate malaria and schistosomiasis outbreaks. Due to their limited access to medical care, artisanal and small-scale mining camps are at high risk of epidemic outbreaks of water-borne diseases such as typhoid or cholera especially where camps lack adequate water and sanitation facilities.

Social marginalization of populations In regions where their activity is illegal, artisanal and small-scale miners who are driven to the practice out of economic necessity are stigmatized and seen as a taboo population. This social marginalization may make it impossible for them to seek medical care or enroll children in local schools.

Loss of human productivity Artisanal mining has been defined as "a purely poverty driven activity" and one that is self-perpetuating due to the inability of miners to develop sustainable vocational skills (Sindig, 2005). Miners exposed to occupational hazards may experience injuries and conditions that make them unable to work in later life. Exposure to mercury has been shown to decrease cognition and IQ, a particular threat to children employed in the artisanal and small-scale mining sector. Moreover, child miners often forego schooling and formal skill development, propagating a growing population of unskilled workers and thus potential societal regression in the years to come (Navch et al., 2006).

Lack of Transparency As artisanal and small-scale mining commonly occurs in an unofficial and often illegal capacity, vital statistics related to environmental and human health impacts are difficult to compile, presenting a significant challenge to prevention and intervention efforts.

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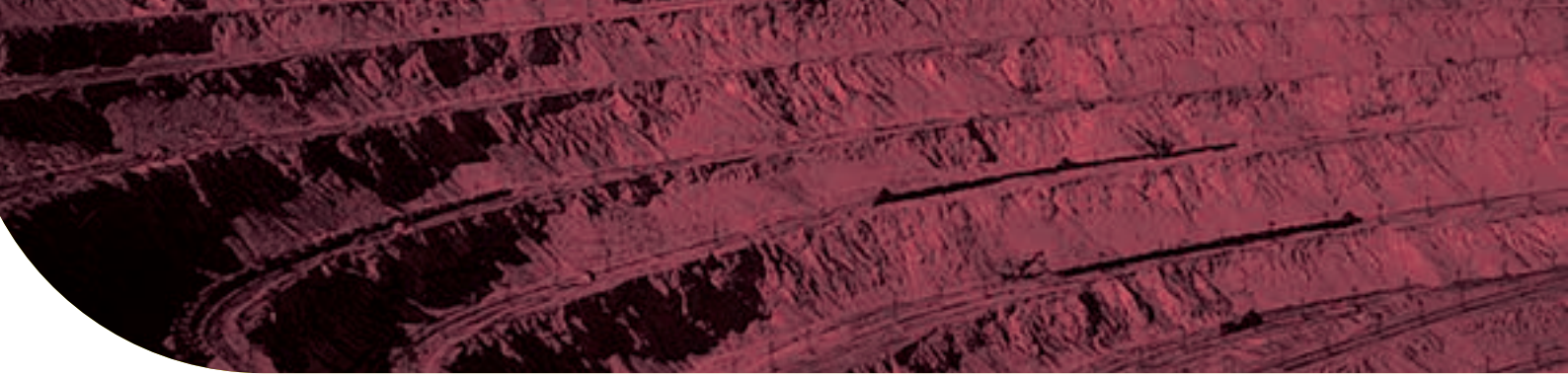
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