Assessing the Integrability of Environmental Impact Assessment and Construction Social Costs

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ABSTRACT

Every type of construction causes significant, and often unquantifiable, inconvenience and disruption for the general public and surrounding environment. These are termed social costs. Construction causative adverse impacts on the neighboring communities are known as the social costs. The construction activities in housing areas have negative effects on neighboring community, such as noise, air pollution, and disruption of the surroundings, closing of roads, detours, damaged facilities, and decreased quality of life for a period of time due to the execution construction projects. Many developing countries, such as Iraq, do not have clearly-defined building regulations and are thus unable to force contractors to mitigate the social costs of the developments. The exposure of nearby residents to these social costs depends, to a large extent, on existing building approval measures and regulations, which differ between countries and even occasionally between regions within countries. Therefore, developing countries like Iraq incur high social costs due to the looseness of their building regulations. This study aims to evaluate the integrability of environmental impact assessment and construction social costs. For that reasons, both qualitative and quantitative methods have been used. The questionnaires were about the adverse impacts of construction on public people to determine the rate of occurring construction social cost for fifteen projects which selected and the researcher interviewed a total of twenty-one voluntary participants by using semi-structured interview. The framework presented in this study provides a useful tool for the consideration of construction social costs in the conduct of an environmental impact assessment and thus, should be a subject of impact studies. This framework provides a link between the biophysical and social dimensions of construction impacts.

Keywords: Environmental Impact Assessment, Construction Social Costs, Construction Activities, Construction Impacts.

ÖZ

Inşaatlarlarin tum çeşitleri, kamuoyu ve çevre için önemli ve çoğunlukla kaçınılmaz, rahatsızlıklara ve bozulmalara neden olur. Bunlara sosyal malıyetler olarak adlandırılmış. Konut alanlarındaki inşaat faaliyetleri, gürültü, hava kirliliği, çevrenin bozukluğu, yol kapatılmaları, yol bozuklukları, ve tesisilerin hasar görmeleri ve uygulama inşaat projeleri nedeniyle yaşam kalitesinin düşmesi gibi çevere ve toplum üzerinde olumsuz etkilere neden olurlar. Irak gibi gelişmekte olan bazı ülkeler, açıkça tanımlanmış inşaat düzenleme kanunları olmadığından dolayi sosyal malıyetleri azaltmak icin mütehitleri zorlayamazlar. Çevredeki ınsanların bu sosyal maliyetlere maruz kalmaları, büyük ölçüde, ülkeler arası ve hatta bölgesel farklılıklar arz eden, mevcut inşaat kanun ve kural düzenleme yönetmeliklerine bağlıdır. Bu nedenle, Irak gibi gelişmekte olan ülkeler inşaat yönetmeliklerinin gevşekliği nedeniyle yüksek sosyal maliyetlere maruz kalmaktadırlar. Bu çalışma, çevresel etki değerlendirme ve inşaatların sosyal maliyetlerinin entegrasyonunu değerlendirmeyi amaçlamaktadır. Bu sebeple, bu çalışmada hem nicel hem de nitel araştırma yöntemleri kullanılmıştır. Anketler, inşaatın kamuoyunda seçilen on beş projenin inşaat maliyetinin belirlenmesindeki olumsuz etkileri ve araştırmacı tarafından yarı yapılandırılmış görüşme metoduyla toplam 21 gönüllü katılımcıyla röportaj şeklinde yapılmıştır. Bu çalışmada sunulan çerçeve, bir çevresel etki değerlendirmesi yürütülmesinde inşaatlaın sosyal maliyetlerinin değerlendirilmesi için yararlı bir araç sağlamakta ve bu nedenle etki araştırmaları konusu olmalıdır. Bu çerçeve, inşaat etkilerinin biyofiziksel ve sosyal boyutları arasında bağlantı oluşturmaktadır.

Anahtar Kelimeler: çevresel etki değerlendirmesi, inşaat sosyal maliyetleri, inşaat faaliyetleri, inşaat etkileri.

DEDICATION

I dedicate this humble effort:

- To my dear mother and father, whose kindness has kept me,
- To my brothers, sisters, and others who inhabit my heart,
- To the guide of my way, my dear supervisor.

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"In the Name of God, Most Gracious and Most Merciful"

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I wish to express my thanks to my parents, who have encouraged and supported me in all my endeavors, and the other members of my family, my beloved sister Shilan, also my great brothers and role models in life, Danyar, Danar and Rebar thanks from the deepest part of my soul.

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Zanyar Omar Abdullah

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AfDB	African Development Bank
CSC	Construction Social Costs
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
IAIA	International Association for Impact Assessment
IEE	Initial Environmental Examination
MEA	Multilateral Environmental Agreements
WB	World Bank

Chapter 1

INTRODUCTION

1.1 Introduction

The success of any project depends, in part, on the consideration of how the natural environment is affected by the processes that come with the development, and the engineered structures. EIA activity is central to the integration of environmental concerns into the process of development for the actualization of sustainable development (Ofori et al., 2000; Glasson et al., 2013).

Every society experiencing growth requires that structures, either temporary or permanent, are erected to provide accommodation, one of life's necessities, and to sustain and maintain the dynamism of livelihood (George, 2002; Ijigah et al., 2013). Housing demand has significantly increased the rate of urbanization, particularly the rate at which building structures are being erected for that purpose. However, this has had the adverse effect of causing environmental degradation, the bulk of which has been shown to be caused by human construction-related activities. Rubin and Davidson (2001) describe 'environmental impact' as the environmental repercussions of human activity (see also Majumdar, 2006). In its highest form, the term denotes the exploration of the interactions between all environmental activities and forms.

The impact of construction activities on the surroundings can be observed for the entirety of the development process, starting with the actual on-site construction, to the period of the building's use, and finally the demolition of the structure, which marks the end of its life cycle. Despite the fact that relative to the building's operational cycle, the construction period itself is relatively short, its impact on the environment is as significant as it is diverse (Gobinath et al., 2010). It is for this reason that the human and environmental effects of construction activities are becoming increasingly salient. Regardless of its adverse environment effects, construction activities are also known to contribute significantly to social and economic development, thus improving quality of life and the societal standard of living (Chen and Wong, 2005).

The process of examining the potential consequences (negative and positive) of a prospective development project, with the aim of guaranteeing these are considered during the design process, is known as Environmental Impact Assessment (EIA). EIA finds its basis in predictions of prospective projects could impact various aspects of the human, natural, economic, and social environments. Consequently, the assessment needs to employ a multi-disciplinary approach and should be conducted during the project's feasibility stage (Gadgil, 2013).

The identification, prediction, evaluation, and mitigation of potential social and other significant adverse effects of a recommended progress in its initial stages form the primary concern of EIA. EIA, according to the International Association for Impact Assessment (IAIA, 2000) is geared towards ensuring all potential impacts and effects are taken into consideration by project decision-makers; it is not a decision-aiding tool but rather a decision-making tool.

The protection of the environment must be done effectively if sustainable development is to be achieved and as Dietz, York, and Rosa (2001) argue, failure to do so and conserve the environment and all of its resources would severely limit the longevity of human development and growth. As such, there is a need to critically assess how the environment is affected by construction activities. By doing just that, EIA also aids the actualization of sustainable development (Bond et al., 2010). There are a number of developments that significantly affect the environment and need to be properly managed. While EIA may simply be ignored in extreme cases, this could result in intractable problems as time goes by. Social and economic developments need be considered with respect to the particular environmental context.

A comprehensive review of the extant literature revealed that just over the past 17 years, a host of definitions of social costs, especially related to civil engineering projects, have been recommended (McKim, 1997; Boyce and Bried, 1998; Yu and Lo, 2005; Rahman et al., 2005). Allouche et al. (2000) for example, describe social costs as those incurred by the contracting parties due to the implementation of a building project. For reasons relating to measurement, they argued that the costs incurred by third parties were due to exposure to air pollution, vibrations, noise, increased traffic accidents, and the disruption of traffic.

It is evident that the social costs of building construction are particularly high in densely populated areas. Furthermore, the general public is becoming more sensitive to ecological issues as they pertain to social rights, thus directing their attention to activities that could have detrimental effects on their individual rights, the environment, households, and society at large. Residential area construction activities in particular, negatively affect and disrupt the routine of those in the vicinity of the site.

The implications of environmental impact assessment and construction social costs are similar, for the simple reason that there are social implications for all environmental impacts. Also, both terms essentially refer to the same thing as it is nearly impossible to exclude the social costs when assessing environmental issues in whatever way. To illustrate, let us take the example of one kind of air pollution, dust. While this is widely recognized to be an environmental concern, its impact is on the surrounding residents and so, even though the analysis might center on how waste materials should be covered during transport, the analysis is primarily driven by considerations of the social impact of this issue (Taylor et al., 2004). As such, individuals, groups, environmental bodies, and the public at large, can be said to represent the social.

Therefore, this study seeks to assess the relationship between environmental impact assessment (EIA) and construction social costs, which assist in incorporating social costs into environmental impact assessment report in projects.

1.2 Problem statement

Various researchers have taken up the issue of how the environment is affected by construction (Teo and Loosemore, 2001; Wong and Yip, 2004). At present, the Environmental Protection Agency (EPA) is responsible for the assessment of all major prospective construction plans via a standardized process such that their sustainability can be determined before approval (Bond et al., 2010).

The construction activities in housing areas have negative effects on neighboring community, such as noise, air pollution, and disruption of the surroundings, closing of roads, detours, damaged facilities, and decreased quality of life due to the execution construction projects. Consequently, it is essential to assess the relationship between EIA and construction social costs because the building construction industry is quickly developing but without any consideration for the construction social costs in developing countries.

Since 2003, the commencement of scores of housing projects and significant investment in infrastructure has led to the growth of the construction industry in Northern Iraq. This supposes the impacts of the building development brought on by construction social costs, particularly in the thickly populated zones, will turn out to be more important. Therefore, it needs to establish a link among EIA & construction social costs.

1.3 Scope and objective

The present study aims to evaluate the integrability of environmental impact assessment and construction social costs.

The objectives are:

- To identify the key drive of the social costs generated due to execution of construction projects.
- To explore the existence of the social costs for Iraqi construction industry.
- To indicate the relationship between EIA & social costs.
- To conceptualize a model to establish a link among EIA & construction social costs.

1.4 Research methodology

The methodology of this research is primarily a mixed method. The primary techniques employed include: a literature review, questionnaires, case study, semi-structured interviews and documents.

For the interviews, the participants were primarily stakeholders (employers, contractors, engineers, and heads of the EIA departments) from the Ministry of Environment, Municipality, and Construction Companies.

To the end of realizing the research objectives, the researcher interviewed a total of twenty-one voluntary participants using predefined questions. The aim was to discover whether or not these stakeholders were sufficiently informed of the theoretical and technical dimensions of EIA. Additionally, the researcher interviewed 3 Heads of Department of environmental impact assessment in the directorates of environment in different cities to obtain knowledge about EIA.

1.5 Research limitations

The primary limitation of this research concerns its data collection, which is wholly dependent on construction companies, public people who live near construction, the Ministry of Environment, and the Municipal government in Northern Iraq. Construction social costs change from region to region and country to country because they depend on the location of the construction, building permission regulations, construction methods, and culture.

The environmental impact assessment classification for project screening in Northern Iraq is as follows:

Category A: This category encompasses projects anticipated to have a variety of significant, unprecedented, and sensitive environmental impacts, such as factories and infrastructure project. These types of projects should be fifteen kilometers away from populated areas and the mitigation of their impact is more easily designed than in Category **B.**

Category B: This category includes building construction projects which have potential adverse environmental impacts such as malls, hospitals, hotels multifunction building. The projects require an EIA report if the area of the project will be more than 1000 m2 or if the project will include a multistory building.

Category C: This category includes projects that are not expected to significantly impact the environment such as houses and small buildings. For this type of projects, EIA report is not required.

For data collection in this study, we selected those projects which are;

- Building construction projects included in Category B.
- Approved by the Ministry of Environment and have an EIA report; and
- Located in a densely populated area.

1.6 Organization of the thesis

This thesis is structured as follows: following this first introductory chapter, which provides a background to the research and a delineation of its aim, objective limitations, and methodology, are a second and third chapter, which provide a comprehensive review of the literature covering environmental impact assessment and construction social costs, and construction-specific and general performance measurements. The fourth chapter delineates the research methods, approaches, and procedure, the fifth provides a discussion and analysis of the study, and the sixth and final chapter concludes the thesis.

Chapter 2

LITERATURE REVIEW

2.1 Origin of EIA

Prior to World War 1, there was a rapid depletion of natural resources due to the rate at which western countries were industrializing and urbanizing. This trend extended into the post-World War 2 period and gave rise to issues regarding quality of life, pollution, and environmental stress. The beginning of the 60s signaled a realization that construction projects did indeed impact the availability of raw materials and other resources, the environment, and people. Consequently, a number of pressure groups were established for the sole purpose of providing a means through which they could ensure that environmental concerns were considered during any development. Taking the lead, the USA enacted the National Environmental Policy act in 1970 to ensure the protection of the environment, and thus became the first country to take legislative action where EIA was concerned (Morgon,2012).The EIA was subsequently formalized, first by the 1972 United Nations Conference on the Environment, Stockholm, and then by later conventions. All developed countries currently have environment protection laws and though sluggish, developing countries are also following suit. Furthermore, a number of bilateral and multilateral lending bodied has also integrated EIA provisions into their criteria for determining project eligibility (Ogola, 2007).

2.2 EIA in developing countries

For the bulk of the time since its emergence, EIA was hardly understood and rarely implemented in developing countries. Opposition came primarily from developers who touted it as anti-development as its attendant policies and laws required a cessation of developments that adversely impacted the environment. As such, they saw it simply as another bureaucratic barrier to development. Furthermore, EIA was often viewed as just another tool through which industrialized countries could keep developing countries in poverty especially as its proponents in these countries were foreigners, supporting the notion that this was just a novel means of neo-colonization. Despite this fierce opposition, EIA has gained increased prominence in many developing countries and is even now statutory in some (Jay et al., 2007).

The decision to undertake a new development has historically been based on its economic viability. At present however, the social and environmental impact of such a development are not taken into consideration as well. These three dimensions (economic, social, and environmental) encompass the “triple bottom-line approach” to project viability (Morgan, 2012).

2.3 EIA legal, policy & institutional framework

EIA operates within a domain regulated by the various policies, legal, and institutional frameworks of different countries and multilateral institutions (UNISDR, 2005). The procedural and provisional recommendations of EIA can prove instrumental in ensuring that a project is successfully implemented.

2.3.1 EIA in international environmental law context

A number of major Multilateral Environmental Agreements (MEAs) have resulted in the advancement of the policy, legal, and institutional arrangements that underpin EIA itself, the most salient of which are outlined in the remainder of this section.

A) Convention on EIA in a Trans-Boundary Context

As the first multi-lateral treaty on EIA, it approached it using a trans-boundary perspective. The 1997 Espoo Convention delineated the responsibilities of that party to it to carry out early assessments of the potential impacts of particular activities, ideally in the planning stage. Moreover, it also outlined the obligation of states to consult with one another on all prospective projects with potentially trans-border ramifications (Wood and Becker, 2005).

Lastly, the convention outlined the procedures, principles, and provisions to be adhered to as well as the relevant activities, significance criteria, and documentation where tens-boundary environmental impacts are concerned (UNISDR, 2005).

B) Rio Declaration

The Rio Declaration on Environment and Development prescribed that EIA can be used as a tool for national decision-making in the assessment of whether or not prospective activities will adversely affect the environment. It also placed particular emphasis on the role a competent national authority had to play in advancing such assessments. The remainder of the declaration concerns, primarily, the actual practice of EIA, as well as the use of its precautionary principle (Cashmore et al., 2004).

2.3.2 Multilateral and bilateral financial institutions

Investment banks, such as the World Bank (WB), European Bank for Reconstruction and Development (EBRD), African Development Bank (AfDB), European Investment Bank (EIB), Asian Development Bank (ADB), and the Japanese Bank for International Cooperation (JBIC), put safeguards in place to protect the environment by ensuring that project finance is provided on the basis of sustainable development, as opposed to purely curative treatment. Despite operational differences between the banks, they all follow a relatively standardized EIA preparation and approval process. The implementation of EIA in numerous developing countries is due to the fact that the banks require the borrowing countries to carry out the assessment themselves. The assessment should be geared towards the suggestion of alternative means of improving project design, planning, siting, implementation, and selection by simultaneously mitigating, compensating, and even preventing negative effects on the environment (Alshuwaikhat, 2005).

As is the case with other banks, the World Bank project-screening criteria are used to classify projects in either of three categories:

Category A: This category contains projects expected to significantly impact the environment in a particularly unprecedented way that transverses the immediate area containing those expected to benefit from the development.

Category B: This category includes projects whose adverse environmental and human impacts are significantly less than in Category A and are primarily restricted to the site-area. However, their impacts tend to be irreversibly but are easily mitigated relative to projects in Category A.

Category C: This category comprises projects expected to have little to no adverse impact on the environment. Projects, once placed in this category, necessitate no further action. Examples of projects that fall into this category include family planning and education (capacity-building, excluding school construction) (World Bank, 1999; Ogola, 2007) etc.

To secure bank financing, the projects also need to adhere to the provisions of the pertinent MEAs the host country is party to, such as: The Kyoto protocol and UN Convention on Climate Change, Aarhus Convention, and the Montreal protocol on greenhouse gas emissions, environmental information, and ozone depleting substances respectively.

It is important that project supervisors and decision-makers a like stay apprised of current versions of these MEAs as they are updated relatively frequently.

2.3.3 National legislations

The laws of the host country may require the EIA to be carried out in a particular way for particular development activities and project types for which EIA is mandatory are often listed in the relevant legislation. For example, the legislation may require the assessment to be conducted by a registered expert(s) while the final review and approval would be within the purview of the relevant authority aided by technical committees and lead agencies (Shetty and Kumar, 2013).

The EIA should also encompass other national laws regarding the protection and use of particular resources (forests, water, fisheries, wildlife amongst others).

2.3.4 Institutional framework

The institutional systems for EIA tend to vary on a country-specific basis and are reflective of the particular governance style of the country in question. Depending on the country, EIA is administered by a Planning Agency, the Ministry of Environment, or some other designated body (Wood, 2003).

Issues pertaining to the environment tend to traverse different disciplines and government bodies within the framework of general resource-management and environmental laws. As such, data pertaining to any environmental studies would need to be sourced from a plethora of technical ministries and other relevant government authorities.

2.4 Preparation of terms of reference (TOR)

The Terms of Reference (TOR) describe what practitioners and consultants are expected to do during the EIA process. While they could either be simple or more complex, the latter is not recommended. While there are not any standard TORs to be recommended for use in every study (Shetty & Kumar, 2013), the following rules should be adhered to when developing the TOR for an EIA:

- The TOR should begin with a short and concise project description, which should also include a plan of the potentially (indirectly or directly) affected areas.
- The study should make sure that the major issues and potential impacts discovered over the course of scoping (such as waste water discharge, air emission, amongst others) are taken into consideration by the consultants or

practitioners. They should also take the time to highlight potential opportunities to enhance any benefits to be realized from the project.

- The TOR ought to explicitly make reference to which policies may be used to safeguard the environment and the applicable legal requirements.
- The TOR should indicate which teams, and the corresponding team leaders, are necessary for the assessment, which itself may be multi-disciplinary depending on the scope. It is noteworthy however, that the team recommendations should not appear to be an imposition so as not to burden the consultant.
- If the EIA is to be left to the competences of international experts, it is necessary that the TOR makes provisions for local capacity building. In addition to building up domestic expertise, this also helps to advance local understanding and involvement as they relate to the issues presented in the study. Due to the fact that the duration of EIA studies are relatively short, the best way to realize these benefits is to insist that local staffs are used for some of the activities pertaining to the assessment or by making provisions for local involvement in the project directive.
- The assessment schedule (start date and duration) should be outlined and the work of the consultants should be restricted to schedule.
- Budgetary limitations should be provided in the TOR, as should be the category of experts (local or international) and the expected length of their participation as these plays a deterministic role for the total cost, which could also be significantly affected by the use of laboratory analysis and large field

surveys. Furthermore, the TOR should also include any attempts by the client to moderate costs.

- The TOR should outline the particular targets at which payments will be made to the consultant. For example, the TOR could state that the client would pay the consultant 20% of the fee when the former receives a draft report.
- The requirements and format of the reports should be explicitly stated and comply with the relevant local and international standards. The EIS format, as well as the number of hard and soft copies of each report should also be explicitly stated.
- The TOR should also allow for the EIA quality to be enhanced by improving the terms within the TOR itself.

2.5 Environmental impact assessment (EIA) process

The first and second phases of the EIA are known as The Initial Environmental Examination (IEE) and the Environmental Impact Studies (EIS; also known as detailed EIA) respectively (Li et al., 2010).

A) Initial environmental examination (lEE)

The purpose of the IEE is to ascertain whether the anticipated adverse impact of a proposed project is significant, or if it can be somewhat mitigated, or in some cases, entirely eradicated. Based on the information available at the time it is carried out, the IEE provides a concise statement of the major environmental concerns and is provided during the initial (pre-feasibility) project-planning phase. Additionally, it also stipulates whether or not in-depth studies are a necessity. The need for an EIA is eradicated by the ability of an IEE to provide definite solutions to all the outlined environmental problems. Environmental specialists need also to provide technical and expert advice so as to allow the IEE to properly identify potential environmental issues.

B) Environmental impact assessment (EIA)

EIA is a technique geared toward the examination of the potential repercussions (positive and negative) of a proposed development with the aim of ensuring that these are taken into consideration during the design of the project. As such, the EIA is essentially a predictive tool and the impacts with which it is concerned could include all aspects of the human, social, economic, and natural environments. As such, the assessment is multi-disciplinary in nature and ought to be conducted in the earlier feasibility project-stage. To put it succinctly, the EIA is an assessment of the environmental feasibility of a proposed project (Ogola, 2007).

EIA is an essential aspect of the project planning process and is carried out for new developments and renovations/expansions, in contrast to the environmental audit (EA), which is carried out for existing projects. (Figure 1) illustrates the phases that constitute the EIA from the screening to the follow-up.

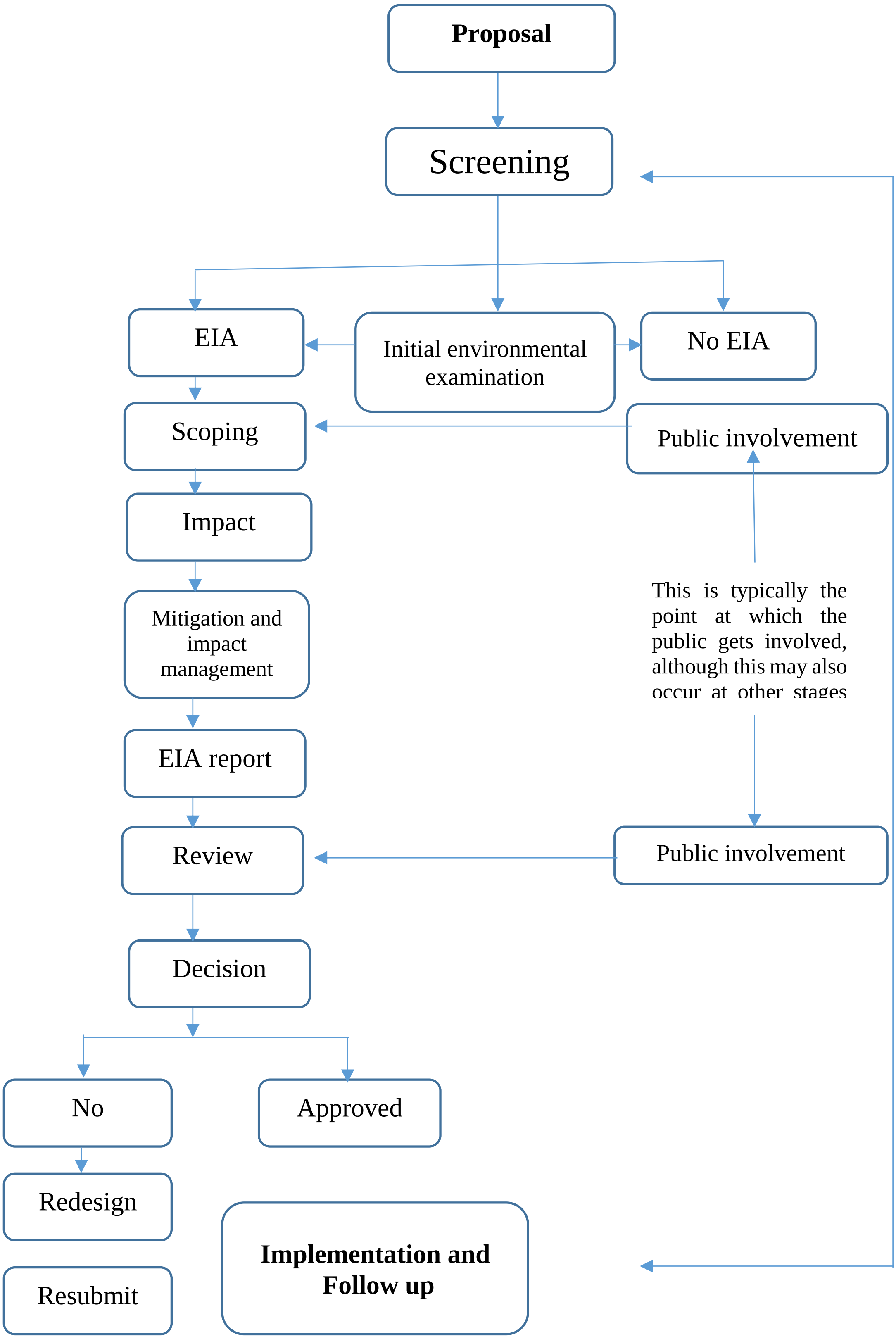

Figure 1: Generalized EIA process flow-charts (Ogola, 2007)

2.5.1 Screening

The process of carrying out the EIA begins first with the project screening, the aim of which is determining if the proposed project should actually pass through the assessment, and in instances where this is the case, what level of detail the assessment should take. The guidelines for determining the necessity of EIA are determined on a country-specific basis depending on the particular norms and laws. Country laws usually outline the particulars of the screening and full EIA. Development banks also use their own predetermined criteria to determine a proposed project's need for an assessment (Wood, 2000).

The end product of the screening process is a codified document knows as the Initial Environmental Evaluation or Examination (IEE), the conclusion of which uses the expected environmental sensitivity of the project to classify it. It is this classification that determines whether or not an EIA would be necessary, and the level of detail in instances where it is.

2.5.2 Scoping

As the EIA is not intended to cover all of the environmental aspects of every single project, scoping is used here to ascertain which aspects are pertinent for a particular project early during the planning stage (Li et al., 2010). The findings of the scoping would determine the depth, scope, and TOR relevant for the particular assessment for the purposes of:

- Identifying the concerns and issues the EIA should consider
- Ensuring the EIA is relevant

- Enabling the study team to be adequately briefed by those responsible for an EIA study on the impacts and alternatives for consideration at various levels of analysis.
- Determining the assessment methods to be used.
- Identifying all affected interests.
- Providing opportunities for the public to be involved in determining what factors ought to be assessed, and enable prompt consensus on controversial issues.
- Saving money and time.
- Establishing the terms of reference (TOR) for the EIA.

The following tools are used over the course of the scoping process, which should last for the duration of the project itself:

Checklists – These are standard lists containing the kinds of impact expected to be seen in a particular project type. The primary purpose of the checklist is certifying that no potential impact is overlooked and that the information used is adequately organized. The checklist is a comprehensive list of the various project features and their impacts on the environment; generic, they are oft employed as assessment aids.

Matrices – Matrices denote the existing relationships between environmental components and parameters, and different project actions. They integrate a list containing the various project-related activities with the relevant potentially affected environmental component. The combination of these two lists (one each on the vertical and horizontal axes) results in a matrix of potential actions, which should cover both the construction and operation phases as the former typically has more of an impact.

Matrices are however, disadvantageous in that they do not out-rightly denote temporal and spatial considerations, and also do not properly cover synergistic impacts (Selvakumar & Jeykumar, 2016).

Networks – A network is a cause-effect flow diagram that outlines the relationships between various project-related activities and their corresponding environmental systems. These networks are useful in the identification of direct and cumulative impacts and require expertise to be used effectively due to their complexity.

Consultations – Decision-makers, interest groups, and affected communities are collectively consulted so as to ensure that all of the potential impacts are identified. The danger however, is that over consultation could result in the inclusion of certain indefensible impacts in the TOR.

2.5.3 Baseline data collection

The term "baseline" denotes a compilation of information on the economic, biophysical, and social settings of the area of a prospective project. The necessary information is typically gathered from secondary sources, through interviews, field samples, surveys, and public consultations. The data collection begins from the inception of the project itself (Slootweg and Kolhoff, 2003) although the bulk of the information is gathered during the scoping and EIA.

Baseline data serves two purposes:

- Providing an description of the status and trends of relevant environmental factors, such as the concentration of air pollution, of the relevant area to the end of comparing these with predicted changes and evaluating their significance; and

- Allowing for actual changes to be detected through monitoring from the onset of the project and solely baseline data necessary for impact predictions in the TOR and scoping report need to be gathered.

2.5.4 Impact analysis and prediction

Forecasting the level at which a prospective development would impact the environment and assessing the significance of such an impact is the center of the environmental assessment process (Ogola, 2007). The basis of such a forecast should lie in the project area's environmental baseline and should predictions should be made in either qualitative or quantitative terms.

2.5.4.1 Considerations in impact prediction

Magnitude of impact: This refers to the extent of the individual potential impacts and denotes whether or not the impact itself may be reversed and if so, at what potential recovery rate. The magnitude of impact is low when it is possible to mitigate a potential adverse impact.

Extent of impact: This refers to the spatial range of the impact. While some impacts may have a limited area of influence in that they are site-specific, the zone of influence for others may extend to the project area's surrounding locality, a much wider regional area, the nation as a whole, or even have trans-boundary/international repercussions (Panigrahi & Amirapu, 2012).

Duration of impact: This concerns the temporal dimension of the impact, which needs to be taken into consideration during the conduct of an EIA. Furthermore, the

EIA also needs to consider impacts that may manifest at different phases over the course of the project. Short-term impacts are those that last anywhere between 3-9 years after the completion of the project, medium-term impacts last between 10-20 years, while long-term impacts last above 20years (Panigrahi & Amirapu, 2012).

Significance of the impact: This concerns the degree of the impact and should be ascertained once a potential impact has been identified. The significance is determined using a set criterion, the primary forms of which are:

- Detailed legal requirements, such as standards, national laws, relevant policies, international agreements and conventions, amongst others.
- The views and complaints of the public.
- Danger to delicate ecosystems and resources, such as the depletion of resources and extinction of species, which could result in conflict.
- Spatial magnitude of the impact e.g. local or international.
- Mitigation costs
- Duration (temporal extent of the impact)
- Probability (likely/unlikely)
- Reversibility (natural or human-aided recovery)
- Number, kinds, and locations of people likely to be affected
- Aggregate impacts e.g. the addition of extras to existing impacts.
- Prediction uncertainty due to an inaccurate data or system complexity; precautionary measures are recommended in such cases.

2.5.4.2 Impact prediction methodologies

Impacts can be predicted using a variety of methods, the choice of which should reflect the particular circumstance (World Bank, 1999). These may on the basis of:

- Professional decisions with satisfactory rationales and supplementary data, which require high levels of professional experience,
- Tests or experiments, which could potentially be expensive,
- Previous experience,
- Statistical calculations and mathematical models, which may require a plethora of data and mathematical modeling competency and without which unknown errors could result,
- Physical or visual analysis. A meticulous description of the impact is necessitated,
- Geographic information systems,
- Risk assessment, and
- Economic appraisal of environmental impacts.

2.5.5 Analysis of alternatives

The purpose of doing this is the establishment of a preferable, more environmentally responsible, fiscally feasible, and nonthreatening alternative for the attainment of the project objectives.

Directives from the World Bank require that proposed investments are systematically compared based on their particular characteristics and factors, such as capital, impacts and the possibility of mitigating them, recurrent costs, raining and monitoring requirements, amongst others (World Bank, 1999). The environmental cost of each alternative should be computed as extensively as possible and the economic values should be affixed where possible, as should simple alternatives. The analysis should also include an alternative course of action in which no project takes place.

2.5.6 Mitigation and impact management

The purpose of mitigation is to minimize or out-rightly avoid potential negative effects and integrate them into a comprehensive environmental management system where possible. Individual plans for mitigating the particular adverse impacts should be documented at every phase of the project as this is pivotal to the selection of alternatives where/when necessary (Lee and George, 2000).

Overall, mitigation aims to:

- provide more suitable alternative courses of action;
- improve a project's environmental and social benefits;
- evade, mitigate, or find solutions to adverse impacts; and
- Safeguard residual adverse impacts from exceeding acceptable levels.

Table 1: Design of mitigation measures

Approach	**Examples**
Avoid	Avoiding important ecological or archaeological features by changing the route or particular site details.
Replace	Establishing a similar, equivalent ecological habitat in a different location.
Reduce	Filter, noise barriers, precipitators, visual screening, wild life corridors, dust enclosures, and altered time of activities.
Restore	Restoring the site post-construction.
Compensate	Relocating displaced communities, financially compensating affected individuals and providing facilities for their communities, etc.

2.5.7 Environmental management plan & environmental monitoring

2.5.7.1 Environmental management plan

The Environmental Management Plan (EMP) is an intricate schedule of the steps necessary for the minimization or mitigation of any predicted environmental impacts revealed during the EIA (Dimen and Ienciu, 2005). The EMP is necessary upon the completion of the EIA and should include the steps to be taken over the course of the proposed project to monitor, mitigate, and even eliminate adverse environmental impacts, or at the very least bring them down to manageable levels. The EMP should also encompass the measures necessary for these to be implemented, including:

- Mitigation on the basis of the impacts conveyed by the EIA, the measures for which should be meticulously described in the EMP.
- The EMP should also outline the different monitoring objectives corresponding to the particular monitoring activities and their relevant mitigation measures. In particular, the monitoring section should provide:

a) A detailed description of and technical details pertaining to the monitoring measures, including the measurement criteria, methods, measurement frequency, appropriate detection limits, sampling locations, and corrective action thresholds;

b) Procedures for monitoring and reporting to guarantee conditions necessitating the adoption of mitigation measures are determined early on and provide information on the progress and success of such measures.

- The EMP ought to also provide a detailed description of institutional arrangements – within who’s purview are mitigation and monitoring measures (for supervision, operation, implementation monitoring, enforcement, financing, remedial action, reporting and training of the staff).

- Furthermore, the EMP ought also to include cost estimation for the recommended activities and measures.
- Compensation should be considered when mitigation measures are determined to be either too costly or infeasible.
- The EMP should operate for the entirety of the project life-cycle.

2.5.7.2 Environmental monitoring

Environmental monitoring involves systematically measuring vital environmental indictor overtime in a predefined geographic area. The environmental indicators being measured should those identified to be most significant by the EIA (Conrad and Hilchey, 2011). There are a variety of monitoring activities, the most common of which are:

Baseline monitoring: Here, a survey is used to determine the state of basic environmental parameters in the immediate area around the intended project site prior to the commencement of construction activities. How these parameters evolve over tie is determined by comparing the baseline against subsequent monitoring values.

Impact monitoring: The socio-economical and biophysical (public health inclusive) considerations of the project areas need to be ascertained during the construction and operational phases of the building’s life-cycle so as to identify changes in environmental conditions (water pollution, dust, air emissions, noise etc.), which themselves could be a product of the implementation of the project (Ogola, 2007).

Compliance monitoring: Monitoring here is done by way of collecting period samples or continuously logging the values for particular environmental quality indicators or levels of pollution so as to guarantee that the project complies with suggested protection standards for the environment.

Monitoring should be carried out consistently over an extended period of time. Interruptions might cause the resulting data to be insufficient, thus hampering the ability to accurately determine the project's impact.

The primary purpose of EIA monitoring is the provision of information necessary for the implementation of the project in such a way that its adverse impacts on people and the environment alike are kept at a minimum.

The following should be avoided during the monitoring process:

- Overestimating the amount of data needed as this could result in a plethora of useless data.
- Underestimating the amount of time and financial resources needed to carry out the data analysis.
- A lack of synchronization between the project schedule, data collection, and seasonal factors.
- Ignoring baseline requirements.

2.5.8 Environmental impact statement (EIS)

The Environmental Impact Statement (EIS) is the final EIA report and its contents are usually determined by country-specific environmental laws. A number of bilateral and multilateral financial institutions also outline what the EIS should contain. The EIS typically includes:

- An Executive Summary
- A Legal, Policy, and Administrative Framework
- A Description of the environment
- A Detailed Description of the Proposed Project
- Significant Environmental Impacts
- A Socio-economic analysis of Project Impacts
- An Identification and Analysis of Alternatives
- A Mitigation Action/Mitigation Management Plan
- An Environmental Management Plan
- A Monitoring Program
- Knowledge gaps
- Public Involvement
- A List of References; and
- Appendices, including:

a) Reference documents, photographs, and unpublished data

b) Terms of Reference

c) Consulting team composition

d) Notes of Public Consultation sessions

2.5.9 Decision making

Every stage of the EIA involves the taking of interim decisions. These decisions are influential for the final decision concerning the assessment.

The EIS is presented to and subsequently scrutinized by a designated authority prior to the taking of the final decision. Authority, in conjunction with a technical review panel, ascertains the quality of the EIS and opens the door for public input. Depending on the review outcome, the authority (or development bank) rejects, accepts, or makes additional modifications to the EIS to circumvent future confrontation. An EIA license is issued with near immediate effect if the EIS is accepted, and additional recommendations are proposed before the license can be issued if the EIS is unacceptable in its present form (Gangolells et al., 2009). The decision-making process ought to be free from external influence to preserve the fairness of the review, the duration of which is typically outlined in the legal framework for EIAs.

2.5.10 Effective EIA follow-up

Over the course of the project's implementation and operation, an EMP, which should have been submitted in conjunction with the EIS report, should be used. In some, particularly developing, countries, there is often little overlap between project implementation and the EIA process (Porkodi & Valarmathi, 2015). Regardless, independent checks are necessary to ensure the developer is acting as expected.

The weaknesses are the result of:

- Faults in the environmental management plans formulated during the EIA.
- Compliance monitoring and enforcement shortcomings when using legal instruments and financial penalties (EIAs are typically concluded when the environmental management authority sends out the environmental clearance).
- In developing countries, some projects tend to have irregular schedules and may be implemented years following the EIA and EMP, in which case a new EMP needs to be developed from an updated EIA.

Environmental Management Systems (EMS), such as ISO 14001:2004, can help link both the EIA and the post-EIA environmental management requirements (during project operation, implementation, and decommissioning).

2.6 Public consultation and disclosure (PC&D)

2.6.1 PC&D from a legal perspective

There has been an increase in recent years in the level of attention garnered by PC&D due to the rise in environmental awareness. The majority of national and international environmental laws are increasingly addressing the issues of public participation and disclosure. Bilateral and multilateral aid and financial agencies are also showing a shared interest in promoting public involvement in EIA (Gangolells et al, 2009).

To this end, they provide assurances that utility commitments to public involvement in decision-making, as they pertain to environmental issues, will be enforced. To illustrate, because the individual's right to a clean and healthy environment is recognize and provided for in environmental law, the environmental management and coordination act contains an administrative process through which public consultations and grievances can be mediated.

2.6.2 Designing PC&D program

Public participation does not lend itself to a single generic approach. A number of issues come into play in the design of any highly-efficient program for public participation. The PC&D planning team ought to:

- Explicitly outline the team's expectations regarding the public.
- Use their respective interests and influences to identify and map stakeholders.

- Focus their attention on public segments most likely to be affecting by the decisions taken (stakeholders).
- Properly integrate them into the decision-making process.
- Secure stakeholder involvement for the entirety of the decision-making process and not just the final stage.
- Allow for different participation levels depending on the public's interest level and reflect the multiplicity of the participants.
- Offer authentic opportunities decision-influencing opportunities
- Take the participation of both internal and external stakeholders into consideration.

Due to the additional costs it might incur, stakeholder involvement in the life-cycle of the project must be incorporated in as cost-effective a way as possible. In addition to mitigate unnecessary expenses, this could also help avoid 'stakeholder fatigue'. The timing and nature of stakeholder involvement is outlined in the table below.

Ample consultation is both time and resource consuming, particularly if the project site is in a culturally and biologically diverse remote location. Therefore, the EIA needs to ensure that the additional costs that may be incurred are provided for in the budget, and the additional time needed for the consultation should be included in the EIA time-frame (IAIA, 2000).

Table 2: Public participation in project cycle

Project cycle	EIA component	Public participation activity
Pre-feasibility	Environmental screening	Public groups are identified and initial contact is made with them.
	Initial environmental examination (IEE)	Continue consultations – the IEE report is supplanted with public input.
	Scoping	The major TOR and scoping issues are identified by way of public input and provisions are made for public involvement.
Feasibility	Environmental impact assessment EIA	The draft EIA report is subject to public review and the public provides input to the survey and design.
Detailed survey and design	Environmental mitigation measures are integrated	The public is presented with a detailed design.
Construction and operation	Environmental monitoring	The public provides input to post-evaluation of impacts and mitigation measures.

2.6.3 Monitoring and evaluation of PC&D

The majority of EIA projects do not have PC monitoring systems integrated into their structure. The quality of public participation over the course of the EIA is assessed by Monitoring and Evaluation (M&E) (Ahmad and Wood, 2002). PC monitoring and evaluation methods include confirming participants' understanding off consultation content (language and technicality), and assessing stakeholders' opinion on the impact of PC on the design and implementation of the project and its overall effectiveness.

The proper use of M&E ensure that public consultation strategies can be modified as needed over the course of the project to enhance the level of participation of the stakeholders, information distribution, and the process by which participant feedback is integrated into the design and implementation of the project (Ogola ,2007)

2.7 EIA guiding principles

The International Association for Impact Assessment (IAIA, 2000), as well as other similar bodies have developed a series of principles intended to guide EIA/IA, some of which are provided below:

Participative: The process out to afford the public ample opportunity to be well informed and even participate in the process. Also, public input should be considered during decision-making.

Transparency: The assessment process, outcomes, and resulting decisions ought to be as open and accessible as possible.

Certainty: The assessment process and timing should be decided upon and adhered to by all of the participants.

Accountability: The decision-makers and project proponents are accountable for their actions and decisions during the assessment to all of the relevant parties.

Credibility: Assessment is undertaken with experience and objectivity.

Cost-effectiveness: The assessment process and its outcomes show protect the environment at minimal cost.

Practical - The process ought to result in practical, implementable outputs.

Relevant - The process ought to concentrate on information pertinent to the development decision-making and planning.

Focused - The process ought to focus on environmental effects and issues of significance where decision-making is concerned

Interdisciplinary - The process should ensure that techniques and experts from relevant fields are used, as is traditional knowledge where necessary.

Integrated - The process should address the overlap between the economic, social and biophysical domains.

Chapter 3

CONSTRUCTION SOCIAL COSTS

Even through a number of researchers have offered varying definitions of it over the years, the term ‘social cost’ lacks a single, codified definition till date. This lack of consensus is indicative of the fact that there are a number of definition-related issues that have skirted resolution (Çelik, 2014).

Regardless of how it is described however, a measure of the ‘social cost’ is necessary to aid in better understanding the concept despite discrepancies in the nomenclatures in the extant literature. The proceeding section offers some of the existing understandings of the concept and provides a contextual measure and definition of it.

3.1 Definition of construction social costs

The majority of social costs attributed to construction are economic in nature. (Button, 1994) argues that, despite the specificity of economics as a subject-area, researchers have displayed a tendency to oversimplify the use of this terminology, as well as its interpretation, in actual practice. He alluded to reasons why it was necessary to clarify the definition of pertinent terminologies from the outset in arguing that doing this guarantees that disagreements over the usage of a particular term are resolved speedily and with much clarity.

This helps avoid the emergence of confusion as a result of certain parties using their own interpretations of terms with either very specific technical denotations or those that belong to an extensive subject-area. It has been observed that, although they have been relatively well studied in economics starting from over a century ago, social costs are relatively novel to civil engineering/construction management (Ormsby, 2009). Moreover, the term ‘social cost’ was initially coined by economists so as to be used in the area of public policy analysis. The consensual definition of social costs proposed by economists (Field, 1997; Erin et al., 2013) goes thus:

> “Social costs are the overall impact of an economic activity on the welfare of society. Social costs are the sum of private costs arising from the activity and any externalities”.

This definition implies that all costs incurred in the execution of a particular activity are regarded as social costs regardless of whether they were incurred either on third parties, or the actual parties involved in the activity. Furthermore, this definition also implies that social costs are equal to the aggregate cost of any project and constitutes: private costs (the sum of the project’s indirect and direct costs) and external costs (costs incurred by third parties as opposed to those involved in the project).

A comprehensive review of the extant literature revealed that a host of definitions of social costs, especially those related to civil engineering projects, have been propositioned in the last seventeen years alone (McKim, 1997; Boyce and Bried, 1998; Yu and Lo, 2005; Rahman et al., 2005). Allouche et al. (2000) for example, describe social costs as those incurred by the contracting parties as a result of the execution of a construction project.

For reasons relating to measurement, they argued that costs incurred by third parties – due to exposure to air pollution, vibrations, noise, the disruption of traffic, and a higher rate of traffic accidents – are also considered social costs. Their research identified the project's total initial cost as the total of its ancillary, direct, and social costs.

In the same vein as Allouche et al. (2000), Gilchrist and Allouche (2005) also suggested that the initial cost of a project should include its direct, social, and indirect costs. For measurement purposes however, they grouped the individual social costs into distinct categories on the basis of the respective area of impact. The resulting categories are: ecological/social/health, traffic, economic activities, and pollution.

Conversely, some other scholars (Rahman et al., 2005; McKim and Kathula, 1999) have chosen to accept the economic definition proposed by Field (1997) and Erin et al. (2013) that propose the entirety of a project's costs are included in its social cost. The relevant social costs here are categorized as either intangible, direct, or indirect costs.

Apeldoorn (2013) opined that the construction projects tend to disrupt societal patterns in the area surrounding the construction zones. The monetary equivalent of these disruptions is what is known as social costs. Differing from other similar studies, two unique categories for the costs of a construction project were suggested – those incurred by the project owner (direct or indirect costs) and those incurred by society as a whole (quantifiable and non-quantifiable social costs).

3.2 Social costs consideration

The bid price calculated by contractors for a proposed project usually does not account for social costs in traditional bid estimation practices (Apeldoorn, 2013). Yu and Lo (2005) argue that these social costs are excluded from the contractual bid value because they are incurred by the public, as opposed to participants to the project. Pucker et al. (2006) similarly posited that project participants do not accept responsibility for social costs related to infrastructure. According to them:

> "For the most part, social costs are not considered during a construction project's planning, design and bid evaluation stages because they cannot be calculated using standard estimating methods. In recent years efforts have been made to introduce approaches for predicting social costs associated with utility construction projects. Nevertheless, integrating method needed for the verification of such prediction methods is lacking".

In current practice, the parties to construction projects – including the owner, users, contractor, and designer – are not considered responsible for these social costs as these are sustained by the public (Yu and Lo, 2005).

Conversely, only the wants, expectations, and needs of the parties directly engaged with the project are considered and addressed appropriately during the design build and construction phases of the project without much attention being paid to those of other interest groups or in relation to the current discussion, the community surrounding the construction site who incur the social costs. This results in the absence of responsibility and the inadequate management of said costs, which could result in public opposition and extend the amount of time to complete the project (Yu and Lo, 2005).

In an effort to properly elucidate the interest groups involved in construction projects, Guoging and Shaojun (2004) defined interest groups as groups who are either directly or indirectly involved in the project at either the preparation or construction stages.

From this, it may be argued that the surrounding society should also be considered stakeholders and thus entitled to increased accountability on the part of other parties to the project. This argument is buttressed by the definition of accountability set forth by Ducoff (2013). He defines accountability as taking responsibility for the actions of others resulting from the execution of a project even when no others out-rightly participate seeing as it occurred under your oversight.

A significant number of researchers have come to agree about the challenge of predicting social costs in absence of a generic method of estimation (Boyce and Bried, 1998; Gilchrist and Allouche, 2005; McKim, 1997; Yu and Lo, 2005; Pucker et al., 2006; Rahman et al., 2005; Matthews and Allouche, 2010).

The primary considerations for estimating the social cost are as follows:

1) Site location
2) Regulations for building permissions
3) Construction methods used
4) The way of life, culture, and tolerance of residents in the vicinity of the site.

3.2.1 Location of construction site

The geographic placement of a construction site is an important consideration where the population of the surrounding area is concerned, especially because the levels of social costs incurred have been found to significantly correlate with population.

Construction activities are expected to have more negative effects in areas with high population densities as opposed to those with lesser populations.

In the same vein, a study conducted by Apledoorn (2013) found that the total social cost resulting from construction activities in densely populated urban areas was greater relative to that in urban areas with lower population densities.

3.2.2 Building permission regulations

The level of social costs sustained by surrounding third parties as a result of building construction is dependent upon extant building regulations and the condition of building-permission granting procedures. In the majority of developed countries, policies are so stringent that the surrounding areas are only minutely affected by construction and experience fewer construction-related problems. In most developing countries such as North Iraq however, regulations are less strict and surrounding residents are more significantly affected by construction activities.

One example of how the lack of regulations affects the surrounding society is how construction workers in some countries go to the site in their personal vehicles and occupy all available parking spaces. Conversely, however, workers in some other countries cannot afford their own vehicles and use public transport facilities, thus eliminating the parking problem. As a result, both the existence and level of social costs depend to some degree on the culture, domestic regulations, and way of life of the people in the country in question.

3.2.3 Applied construction methods

The type of construction method(s) used in infrastructure of building construction projects plays a very important role in regards to the resulting social costs. In the past few years, a number of scholars (Apeldoorn, 2013; Matthews and Allouche, 2010) have taken a comparative look at open cut and trenchless construction methods for infrastructure, especially in regards to their respective social costs. Consequently, it has been determined that the social costs of the open-cut construction method are higher than those of the trenchless method.

To put this in perspective, Woodroffe and Ariaratnam (2008) argued that the social costs of an open-cut project could even by several times higher than the project's overall value whereas in trenchless projects, the value is merely 30% of the project's total cost. As social costs manifest themselves on a daily basis, the length of the construction project is equally of importance.

In light of this, it has been suggested by Herbsman and Glagola (1998) that construction companies reduce the amount of time needed for a construction project considerably by employing pioneering contracting methods developed precisely for the purpose of mitigating the social costs incurred by constructions projects. From the foregoing, it is evident that the construction method used strongly correlates to the created social cost.

3.2.4 Culture, tolerance and way of living of nearby residents

Levels of tolerance and ways of living vary from region to region and culture to culture thus highlighting the importance of not standardizing the indicators of social cost.

3.3 Social costs occur throughout a construction project

Many social costs that result from the execution of a construction project have been discussed in the extant literature. Some scholars have taken to attributing social costs to particular construction processes – infrastructural or building assembly – while others attribute the social costs to construction on the whole as opposed to specific processes (Celik, & Budayan, 2016).

An approach to the computation of social costs using public utility works was proposed by Read and Vickridge (2004); the types of social costs identified in their research relate solely to the infrastructure-based construction projects. They posited 11 possible social costs of public utility projects: diversion route effects, traffic, over pumping, noise, visual intrusion, dirt and messy surroundings, dust, plant and materials, vibration, air pollution, and safety.

Yuan et al. (2013) categorized the social costs associated with residential building construction into: the impacts on the community, the environment, the economy, and public property. The four main categories comprise eleven individual social costs, namely: the cost of damages to health, costs resulting from decision-making errors, the cost of damage to civil rights, the effect of transportation costs, property damages, decreased productivity, and loss of income, loss of revenue, the cost of pollution, the cost of damage to existing buildings resulting from construction, and resource costs.

Similarly, Wang (2011) analyzed urban underground expressway construction on the basis of the attendant social costs in order to determine what social costs were specific to this type of construction. He identified traffic delays, access restrictions, pollution, pavement damage, safety, amongst others, as the foremost social costs experienced in this kind of construction.

The literature is full of numerous studies concerned with the various types of construction projects and determining their respective social costs. The social costs associated with construction activity do not vary greatly. However, this depends, to a large extent, on the sort of construction project under consideration. For example, air pollution in the form of dust is expected in both road and residential construction.

It is for this reason that social cost considerations are expected to be relatively consistent regardless of the typed of construction project but with varying degrees of intensity. Consequently, some scholars have taken to classifying social costs themselves as opposed to classifying them on the basis of project type. Yu and Lo (2005) for instance, opined that 3 categories of social costs are common to each construction project – environmental impact, traffic impact, and business impact. Environmental impact refers to the daily environmental costs to the public as a result of the construction e.g. daily noise and air pollution costs; traffic impact relates to costs incurred by vehicles and road users due to construction; and business impacts are the losses indigenous business incur as a result of construction activities, such as losses in income and productivity. Ferguson (2012) used a similar classification for construction-related social costs.

Chung and Poon (1997) add to the aforementioned list by including amenity and aesthetic-value losses as some of the social costs of construction. They however conceded that the numeric values of these social costs are somewhat problematic to compute.

Gilchrist and Allouche (2005) posited their own categorization of social costs. These are: economic activities, traffic, and social/ecological/health costs. These categories were elaborated further with the addition of subcategories contained in two principal headings – adverse impact and social cost indicators. A breakdown of the structure of construction social costs proposed by Gilchrist and Allouche (2005) may be found in (Figure 2).

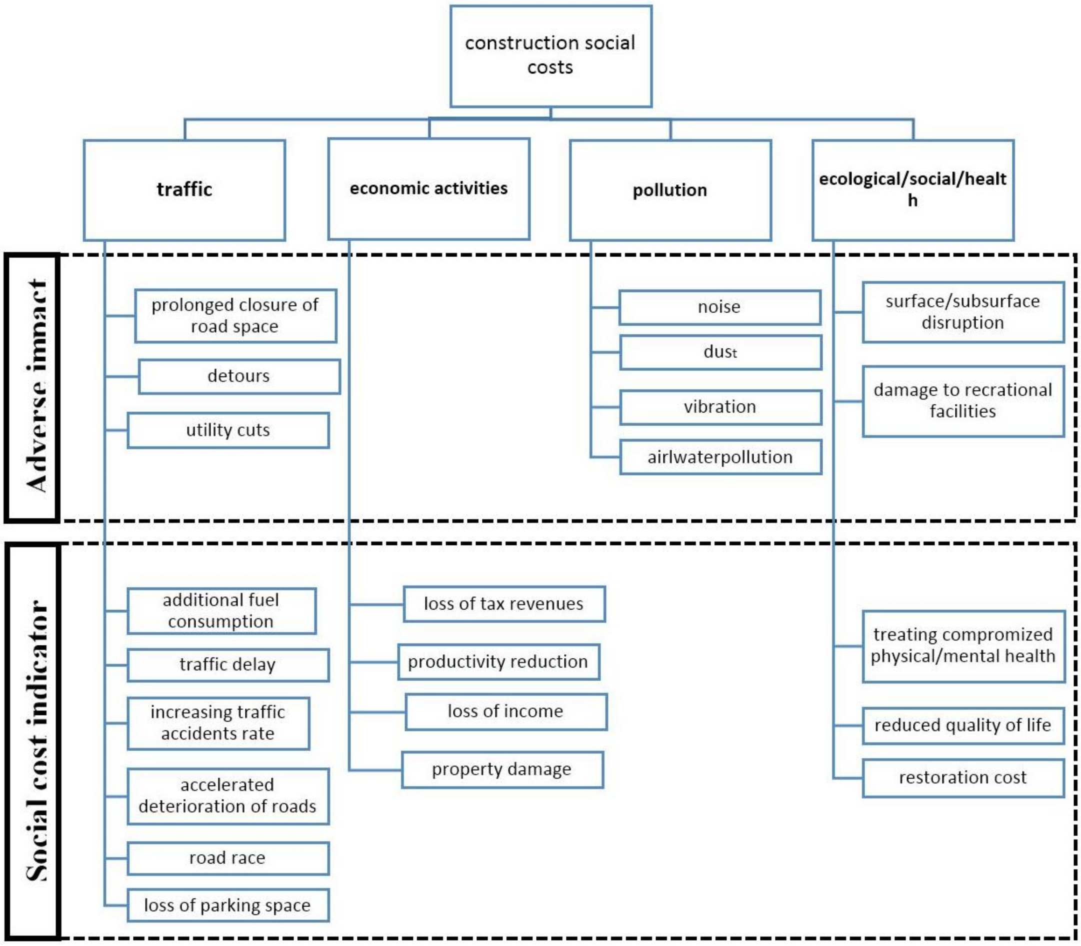

Figure 2: Potential construction adverse impacts which lead to formation of the social costs re-drawn (Gilchrist and Allouche, 2005)

Adverse effects are negative effects on the environment that result from construction. Social cost indicators on the other hand, are the result of one or more adverse effects of social costs on the surrounding environment that result from the execution of a construction project. The effects are described mainly they may be used in the monetary quantification of social costs.

3.4 Potential adverse impacts of construction related activities

All the various types of social costs included in this research have their own adverse effects. Consequently, they are all grouped into a particular type of social cost. The adverse impact of these costs need to be properly articulated and discussed as they are the parameters taken into consideration during construction.

3.4.1 Traffic

Many of the adverse effects on traffic flow as a result construction activities have been cited in the literature (Lee et al., 2005; Jiang, 1999). In particular, highway renovations have been known to directly impact the flow of traffic and cause social costs to be incurred by road users in terms of reduced speed, altering traffic patterns, and outright lane closures.

However, urban area construction projects can also affect traffic. Accordingly, the traffic-related construction social costs should also be considered in urban-area construction projects in addition to highway renovation projects. In the same vein, Gilchrist and Allouche (2005) alluded to 3 adverse impacts, namely: detours, utility cuts, and the prolonged closure of road spaces.

3.4.2 Prolonged closure of road space

Despite the fact that the majority of construction activities occur inside the boundaries of the construction site itself, some of the necessary activities need space beyond these defined boundaries. Examples of such activities include the movement of machinery during construction, and corridors for entry and exit. Entry/exit corridors are particularly poised to affect the flow of traffic in urban areas as they limit the capacity for maneuver afforded to construction vehicles relative to ordinary vehicles.

Consequently, traffic congestion, changes in traffic patterns, and a loss of parking spaces emerge in roads close to construction sites. This could translate into time delay expenses, additional fuel consumption, increases in the amount of traffic accidents, vehicles loss costs, and environmental pollution (Mao et al., 2012).

3.4.3 Detours

As has been mentioned earlier, roads may sometimes be closed for construction activities. Consequently, vehicles are redirected to alternate roads designed for lighter traffic in an effort to reduce congestion and circumvent unnecessary delays. This can lead to the emergence of problems linked to the deterioration of the road pavement as a result of overloading, thus decreasing the viability of the pavement structure and necessitating the resurfacing and repaving of the pavement before time. Additionally, detours increase costs for drivers as it increases the distance, fuel, and time used.

3.4.4 Utility cuts

Telephone, water, internet, and electricity lines, amongst other, may also be cut either as a result of construction activities or for the provision of utilities to the construction site itself.

3.4.5 Economic activities

Businesses in the area surrounding the construction site may be adversely affected by construction for the duration of the project as customers might face challenges in reaching the businesses due to road closures and detours. Additionally, customers might avoid such areas altogether due to the amount of dust and noise generated by construction.

This could lead to losses in the affected companies' income. Furthermore, the income of homeowners may also be affected for at least three reasons. Firstly, property values might drop due to the drop in aesthetic value and high levels of noise and dust. Secondly, they might lose income from rent. Lastly, properties close to the construction site might become damaged during construction leading to increased costs for homeowners in terms of repairs and maintenance. In some cases, however, governments have taken steps alleviate the plight of homeowners. Manchester airport for example, provides financial assistance to surrounding homeowners for sound proofing or relocation (Manchester Airport, 2013).

3.4.6 Pollution

The existing literature has addressed the adverse environmental effects of construction projects (Teo and Loosemore, 2001; Wong and Yip, 2004). Furthermore, it has been argued that construction activities' impact on the environment is becoming of increasing concern to public agencies governments. As a result, Gilchrist and Allouche (2005) believe pollution to also be a social cost of construction. The 4 primary types of pollution resulting from construction activities they consider are those due to dust, noise, air, vibration, and water pollution.

3.4.6.1 Noise

Noise may be described as sound capable of causing psychological symptoms e.g. cardiovascular disease, anxiety, high blood pressure, restlessness, sleep disturbances, irritability, and hamper concentration (Akan et al., 2012; Gilchrist and Allouche, 2005). According to Bein (1997), noise has the capacity to affect behavioral, social, physical, and mental health. The implication therefore, is that governments should take high decibel noises seriously, particularly in urban areas.

Unfortunately, one of the leading causes of noise is construction. Noise is produced by site operations, such as the use of generators, operator pumps, heavy earth moving and paving equipment, and demolition activities. In addition to the physiological and psychological effects of noise, noise may also have economic effects.

3.4.6.2 Dust

Another negative environmental consequence of construction is dust. During the length of construction activities, excessive levels of dust can be seen around the construction site. The dust can lead electronic and mechanical equipment to malfunction. So, it is necessary for governments to set aside funds for cleaning and maintenance.

The dust in the atmosphere lowers crop yields and adversely affects the aesthetics of the environment. Dust could also result in decreased lung function, increases in hospitalization resulting from respiratory issues, and death from respiratory and cardiovascular problems (Woskie et al., 2002).

3.4.6.3 Vibration

Digging, compacting, pile driving, blasting, and the use of heavy equipment cause strong vibrations to be felt around the construction site. Because these vibrations have the capacity to damage adjacent structures, the vibrations can lead to social costs. Furthermore, they may also affect sensitive equipment in surrounding businesses and hospitals leading to unanticipated and even fatal consequences.

In conclusion, high frequency vibrations have the capacity to induce psychological distress due to a perceived lack of safety. Similarly, low frequency vibrations might also have a traumatic effect (Read and Vickridge, 2004).

3.4.6.4 Air pollution

The majority of the equipment used during construction have high-powered engine that tend to generate harmful emissions that can cause harm to humans and other living organisms. The emissions, in addition to the danger posed to the lower atmospheric layer, may also affect the Earth's ozone layer, which absorbs dangerous ultraviolet rays.

3.4.7 Ecological/social/health

Construction projects may also adversely affect ecological systems, particularly surface water areas, the groundwater table, and recreational areas in addition to the quality of life of residents in the surrounding areas as a result of pollution and traffic.

Fatal diseases such as respiratory illness, allergies, and cardiovascular illness, amongst other may also result from environmental pollution. Gilchrist and Allouche (2005) mention two negative effects related to the possible damage done to ecological systems: the damage to recreational areas and surface/sub-surface disruptions.

3.4.7.1 Surface/subsurface disruption

While the adverse effects of construction on the ground are relatively noticeable, construction also affects natural bodies of water and groundwater around the construction site. Construction activities may affect a water body's natural structure and result in the erosion of the bank, flowing, damage to aquaculture, and the course of the rivers and streams being altered (Gilchrist and Allouche, 2005).

In an effort to aid construction, the level of the ground water beneath the construction site is often decreased by way of deep wells, well points, and horizontal drainage. These operations however, may result in serious environmental repercussions, such as the corrosion of green life and less water for agricultural activities.

3.4.7.2 Damage to recreational facilities

The usability of recreational facilities might be either temporarily or permanently affected by the presence of noise, heavy equipment, vibration, dust, and visual pollution. The cost of refurbishing such facilities might be very high if the necessary precautions are not taken beforehand.

Chapter 4

RESEARCH METHODOLOGY

4.1 Introduction

While usually, and wrongly, taken to involve information gathering, the documentation of facts, and search for information in general, the research process actually involves the collection, analysis, and interpretation of data to the end of understanding a phenomenon (Leedy & Ormrod, 2001). The research process involves the definition of an objective, data management, and the report of findings, all in a systematic manner and with respect to existing frameworks and guidelines. Such frameworks and guidelines serve to aid the researcher in defining the subject of the research, research method, and the prospective conclusions that could draw based on the research outcome.

Research in construction management is neither pure natural science nor absolute social science (Love et al., 2002). It is somewhere at the crossroads between the natural and social sciences. Love et al. (2002) note that construction management researchers mostly borrow methodologies from other fields without completely analyzing whether they fit the nature of problem or not. They further that, for better research outcomes and to solve the problems in a more holistic fashion, construction management researchers need to understand the distinctions between natural science and social science as well as the research methodologies that go well with each kind of research.

Over the last decade, construction researchers have exchanged views on what research methodologies best suit the kind of problems that construction research usually grapples with. During the mid-nineties, a number of researchers presented their thought on what methodologies should be employed for construction Management research (Abowitz et al., 2010). This debate or paradigm war' problematized the dominant position enjoyed by rationalism in the research community. According to Dainty (2008), the debate was somewhat polarized around the relative merits of different research paradigms.

4.2 Research approaches

There are three primary research approaches that could be used in the conduct of any research project. These are the qualitative, quantitative, and mixed methods. In deciding which is more appropriate for a particular project, the researcher must first determine the kind of data – numerical, textual, or both – that is needed to answer the research question. Qualitative approaches are usually used to answer questions that require textual data, while quantitative approaches are used to answer questions with numerical data. Mixed methods, on the other hand, are used to answer research questions that require a mixture of numerical and textual data. This research uses such a mixed method approach (Creswell, 2013).

4.2.1 Quantitative approach

Quantitative research method endeavors to amplify reliability, objectivity, and generalizability of discoveries, then are normally inspired through prediction (Harwell, 2011). This methods studies statistic, number and anything that is quantifiable systematically of examination of phenomena. In addition, it is utilized to response inquiries on connections inside measurable factors by a purpose to clarify, anticipate and control phenomena. Moreover, it offers a logical and systematic way to provide a reasonable answer for research questions (Leedy, 1993). Quantitative methods are regularly defined as deductive approach; it is the great technique to set up cause-effect connection amongst factors and their consistency in a causal relationship. This technique is thought to be the decent one since it accommodates a high level of control over incidental factors and the control of variables. It increases reliability and decreases bias. It tests hypotheses and theories of fundamental connection amongst factors and variables. It additionally allows drawing derivations around causality (Amutha & Ramganesh, 2013).

Key elements of numerous quantitative researches are the usage of instruments, such as, surveys to collect data. Tests, and dependence on likelihood theory to test arithmetical hypothesis which relate to research question (Harwell, 2011). The studies are more unbiased and examined data can be applied as a part of testing the hypothesis. For this research, the researcher used a questionnaires as a famous type of tool for performing quantitative research.

4.2.2 Qualitative approach

Qualitative research involves an all-inclusive attempt at discovery. It has been described as an “unfolding model” that takes place in a natural environment whereby the researcher is allowed to pay an enhanced attention to detail through active involvement (Harwell, 2011). As such, qualitative research can be identified by a participant-view investigation of a social phenomenon and can be framed using a variety of research designs depending on the context. The techniques used in different research designs significantly affect the choice of research strategy.

Qualitative research strategies are used in the description, explanation, and interpretation of data. However, Leedy and Ormrod (2001) argue that description in qualitative research is relatively less structured than in quantitative research as the former is usually used in the formulation of new theories.

In contrast to deductive reasoning used in quantitative research, the premises of qualitative research utilize inductive reasoning whereby questions are posed based on observation. This correlation between the researcher and the data is another way in which qualitative research differs considerably from quantitative research where the researcher and the phenomena in question are distinct from one another; the researcher does not take any preexisting assumptions into consideration (Leedy and Ormrod, 2001). Qualitative research uses empirically collected sensory data to develop new theories that explain phenomena related to social behavior. In conclusion, it has been found that there are significant differences between particular research methods in qualitative and quantitative approaches, in addition to the differences between them.

4.2.3 Mixed approach

As an approach, the mixed method involves the collection and integration of both qualitative and quantitative data using innovative designs that embody a mix between theoretical frameworks and philosophical assumptions. The underlying rationale is that in combining qualitative and quantitative approaches, the researcher will obtain a more holistic understanding of the research question, which would not be possible using only one approach (Mack et al., 2005).

4.3 Participants

The participants of this survey consist of two different groups:

First group of participants are stakeholders (employers, contractors, engineers, and heads of the EIA departments) from the Ministry of Environment, Municipality, and Construction Companies. Second group of participants are people who reside within a 120 m radius of the construction site.

It is significant here to mention that, according to Watkins (1980) and Hunt et al (2014), construction projects causative additional dust formation significantly disturb the residents within 150 m of a construction site. Additionally, some researchers made an attempt in measuring and quantifying the noise pollution through people residing within 120 m of a construction site (Gilchrist and Allouche, 2005). Therefore, in this study it was decided to investigate people who reside within 120 m of construction sites.

The primary reason why these people are of interest is that they have knowledge pertaining to the construction industry and consequently, could enrich the study.

4.4 Sample size

Deciding a suitable sample size for a study is a problematic part of any study and requires careful attention. The sample size should neither be so small that it results in unrepresentative data, or so large that it demands an excessive amount of time from the researcher and participants alike. In determining the sample size, the following considerations should be taken into account:

- How willing the participants are to partake in the research?
- How extensive is the risk posed to the data by specific factors like participant confidence?

- How substantial are the resources available to the researcher relative to technological requirements, time, and the number of participants?

The questionnaire was sent out to 215 male and female participants. All of the participants were handed the questionnaires directly. 195 of them completed the questionnaire and returned it on time. Then, the researcher interviewed a total of twenty-one voluntary participants by using semi-structured interview. Additionally, the researcher interviewed Heads of Department of environmental impact assessment in the directorates of environment in different cities to obtain knowledge about EIA.

Furthermore, fifteen case studies have been included. The reason for choosing these case studies were, each project has EIA report and in the same time these projects were under construction phase.

4.5 Data collection tool

Both qualitative and quantitative methods have been used. The fundamental tools used in this investigation were questionnaires, interviews and a case study. Data collection relied on the knowledge of individual participants. A mixed method, as described by Lund (2012), is used here because neither qualitative nor quantitative approaches are superior as each offers distinct advantages (Greene, 2007).

A qualitative approach allows the researcher to gather more information, and gain a better understanding of the reasons underpinning particular responses and the opinions of respondents regarding particular experiences (Wolcott, 2009). On the other hand, a quantitative approach, such as the questionnaires used here, allows the researcher gather information on a variety of issues in less time (Williams, 2011).

4.5.1 Questionnaires

- The first section of the questionnaire collected participants' general information. For instance, gender, age, their level of education, amongst others.
- The second section was about the adverse impacts of construction on public people to determine the rate of occurring construction social cost for fifteen projects which selected. All of the questions had five answers which are reached from very low, low, medium ,high ,very high

4.5.2 Interviews

Due to a realization that interviews were more concerned with sounding academic and modifying answers than with providing specific answers to questions by focusing on the content of their responses, the researcher decided to change strategy and conduct the interviews in Kurdish rather than English. This also helped avoid embarrassing non-English speakers, improve interviewee confidence, and highlight the fact that the content of responses was more important than the use of academic language.

4.5.3 Case studies

The case study method affords the researcher the opportunity to situate data analysis within a particular context. Most case study research involves a small and clearly-defined geography, or a small number of subjects. Case studies essentially investigate modern real-life phenomenon through the analysis of the nature of, and relationships between, a limited numbers of events in a particular context.

The case studies in this research will be presented according to classification for project screening in Northern Iraq as explained in previous chapters. Researcher selected fifteen projects as a case study which those projects had an EIA report also located in populated area.

Table 3: Case studies projects

No	Name of projects	location	EIA	populated area	No. of participant
1	Haware jwani project	Sulaymania city	✓	✓	12
2	Mako mall project	Erbil city	✓	✓	14
3	Jaf tower project	Sulaymania city	✓	✓	16
4	Azadi mall project	Sulaymania city	✓	✓	12
5	Sharo Hotel project	Duhok city	✓	✓	9
6	Bander palace project	Erbil city	✓	✓	13
7	Himyat hospital project	Duhok city	✓	✓	11
8	Kurd tower project	Sulaymania city	✓	✓	15
9	Plaza hatel project	Erbil city	✓	✓	10
10	Rotana hotel	Sulaymania city	✓	✓	18
11	Hawrin building project	Duhok city	✓	✓	13
12	Bnawsh tower Project	Duhok city	✓	✓	14
13	Haify hospital project	Sulaymania city	✓	✓	13
14	Life hospital project	Erbil city	✓	✓	14
15	roza building project	Erbil city	✓	✓	11

4.6 Data analysis

After collecting all the completed surveys, Microsoft Excel and SPSS were used in computing and analyzing the outcomes.

SPSS (Statistical Package for the Social Sciences) version 22.0 is statistical software used to analyze the quantitative data. SPSS is a computer software which have a high functionality in examining statistical data and providing precise statistics in graphical as well as descriptive format (Flynn, 2003). The interview data were subjected to content analysis. Content analysis is a technique and procedure that allows researcher to investigate human behavior and actions in an indirect way, during an examination of their communications (Fraenkel et al., 2011). All data of interview were read completely to detect meaningful parts grounded on the research questions as well as was allocated descriptive codes to these parts. In addition to the interviews were analyzed and explained by the researchers in data analysis chapter.

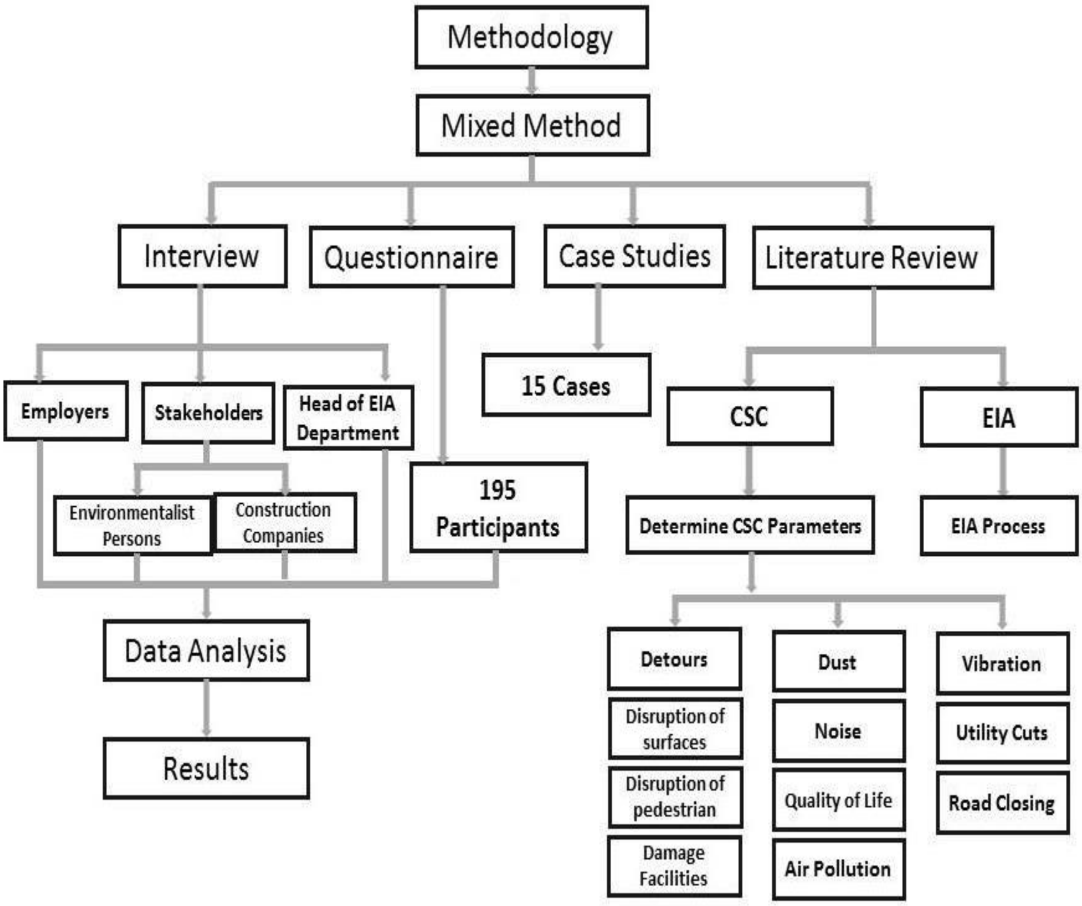

Figure 3: Research design

Chapter 5

DATA ANALYSIS

5.1 Introduction

From 1991 onwards, the construction sector became a significant element of the economic growth of the Kurdistan region. 2003-2013 witnessed the dynamic growth of the region. The Economist Intelligence Unit stated that the region was highly place in terms of macroeconomic environment, market opportunities, and origin direct investment policy. The year 2006 was particularly productive as foreign investors became allowed to become land-owners and majority stakeholders in cooperative ventures (Soderberg and Phillips, 2015). In particular, the building and construction sector contributed significantly to this growth at ID 355billion in 2006, up from ID 46.8billion in 2004 and a shocking ID 15,294.17billion in 2007.

The Regional government is particular involved in construction industry operations due to their capital-intensive nature. Regional authorities invest billions of dollars in the form of government-sponsored construction projects, which cover 4 basic areas: building construction, road construction, maintenances, and other construction projects (airport runways, dams, etc.). The projects are funded through budgetary allocations, including the constitutionally-mandated 17% of the Iraqi budget allocated to the Regional Government. While the government typically undertakes the construction of these national assets by itself, individuals and other private partners are usually involved in building construction.

Table 4: Categories of construction projects in Northern Iraqi Government

<table>
<tr><th></th><th>Building</th><th>Road</th><th>Others</th><th>Maintenance</th></tr>
<tr><td>1.</td><td>Domestic</td><td>Highways</td><td>Dams</td><td rowspan="5">For all three previous categories</td></tr>
<tr><td>2.</td><td>Commercial</td><td>Urban, Town</td><td>Irrigation</td></tr>
<tr><td>3.</td><td>Factories</td><td>Tunnel</td><td>Electric station</td></tr>
<tr><td>4.</td><td>Investment</td><td>Runway for airport</td><td>Water distribution line</td></tr>
<tr><td>5.</td><td>Offices , Publics</td><td>Village</td><td>Tele communication</td></tr>
</table>

Quantity-quality and establishing standards

Starting with only minimal development just over a decade ago, the sector has logically been focused on the construction of as much as possible in as little time as can be managed. The increasing convergence between demand and supply, and the arrival of foreign firms to Northern Iraq has increased the salience of the issue of quality. The majority of the foreign firms coming to the Kurdistan region are demanding graded office spaces. The increased demand has led developers to take the issue of quality particularly seriously in their new developments.

It has been argued that many of the new office spaces on the marked do not comply with the international standards outlined by global organizations. Regardless, the quality of the region’s real estate has improved at an impressively fast past, motivated primarily by the increased demand for quality, even as the factors essential for foreign businesses are scantily considered. A host of private sector changes is necessary to ensure the progress of the construction sector. The quality of its projects may also be improved by utilizing supervision as a means to ensure that development and construction firms properly design and execute their projects, thus holding the builders accountable to project owner and designers (Gunter, 2011).

Despite the growth it has achieved thus far, the construction industry remains somewhat underdeveloped, relative to those of developed countries. In December, 2008 RTI-international reported that a number of challenges remain, including: a shortage of skilled technicians, managers, engineers, and an accurate system of quality control.

Much remains to be done, even as market demand is increasing the overall quality of projects in the region. The persistence of low-quality construction methods is as a result of the limited enforcement of unified building standards by the KRG. Unwilling and unable to police itself, market demand can only drive quality improvement to a limited extent.

Dominant international firms in Northern Iraq desire a dynamic legal and regulatory environment. The rigid enforcement of building controls, regulations, and planning is necessary, with particular attention being paid to safety and structural integrity. These international firms see the establishment of universal standards as vital to the sector's advancement.

5.2 Construction social costs in Northern Iraq

Construction activities affect the environment for the entirety of the development life-cycle. These effects are a result of the initial construction, operation, and eventual demolition of the building at the end of its life-cycle. Even though it is the shortest of all the other stages in the building's life, the construction stage still has a number of significant, negative, environmental effects (De Leo and Levin, 1997). As such, the impact of construction activities on the environment and human health is gaining increased salience. Regardless, construction also has the capacity to significantly contribute to social and economic development and enhance both quality of life and living standard (Azqueta, 1992).

Every type of construction causes significant, and often unquantifiable, inconvenience and disruption for the general public. These are termed social costs. Building construction sites in residential area often reverse in adverse effects on the affected community's quality of life. Many developing countries, such as Iraq, do not have clearly-defined building regulations and are thus unable to force contractors to mitigate the social costs of the developments.

An investigation into the existence of social costs during construction projects in Northern Iraq was undertaken. It was uncovered that building construction sites constitute a nuisance, denoting the incursion of social costs.

Yuan et al. (2013) outline four main categories of residential building social costs – economic impact, public property impact, community impact, and environmental impact. These four categories are further split into eleven individual social costs: property damage, pollution, loss of revenue, loss of income, decreased productivity, altered transportation costs, health issues, decision-making errors, cost to civil rights, resource costs, and damage to existing buildings due to nearby construction activities.

The exposure of nearby residents to these social costs depends, to a large extent, on existing building approval measures and regulations, which differ between countries and even occasionally between regions within countries. The environmental effects of construction in developed countries are significantly reduced as these countries have strict building regulations.

Conversely, developing countries like Northern Iraq incur high social costs due to the looseness of their building regulations. Consequently, we propose that integrating social costs into the environmental impact assessment report directly mitigates the building construction caused social costs during construction.

Based on the case studies, questionnaires, and interviews, this chapter illustrates the real problems related to construction-related social costs in an urban area. A total of 11 project-related social costs were determined: noise, dust, vibration, air pollution, dust, close of road, detours, utility cuts, quality of life, surface disruption, damage facilities, and Pedestrian place.

5.3 Questionnaire response rate

Over two hundred and fifteen (215) questionnaires were manually handed out as part of the survey, of which one hundred ninety-five (195) questionnaires have been completed and accepted.

5.4 Respondents' profiles

Generic information on the survey respondents is provided in this section. The aim is to provide background information on the respondents' gender, age, and level of education, and consequently determine how reliable the information they provide is.

5.4.1 Gender

This questionnaire was distributed to male and female participants as gender differences are not a consideration of this study. 103 females (52.8%) and 92 males (47.2%) completed the questionnaire, as shown in Figure 4.

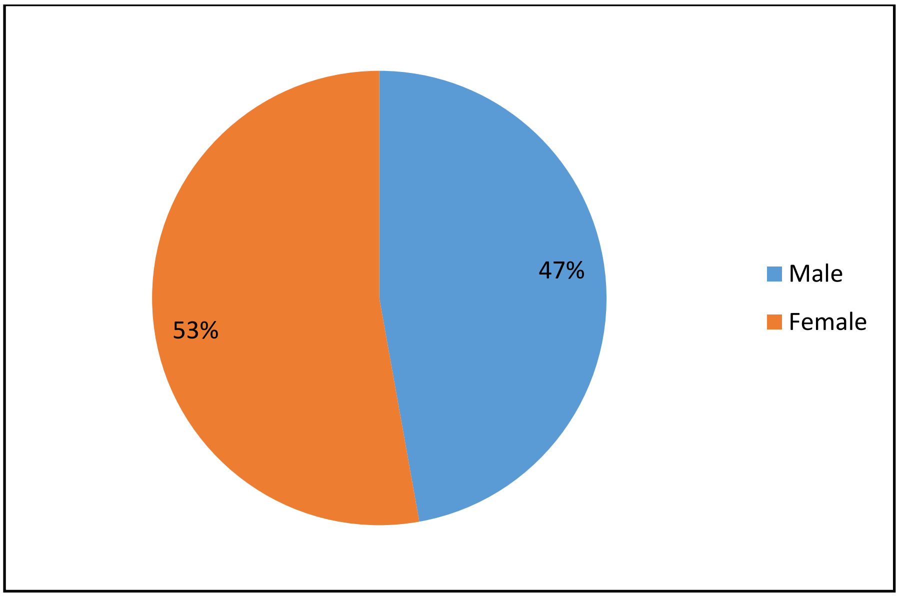

Figure 4: The participant's gender

Table 5: The participant's gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	103	52.8	52.8	52.8
	Male	92	47.2	47.2	100.0
	Total	195	100.0	100.0	

5.4.2 Age

While this was not one of the concerns of the research, it was necessary in order to ensure that all participants fell within a suitable age-range and satisfied the study requirements. 19% were between the ages of 18-27, 38% were between 28-37, 28% were 38-47, 12% were 48-57 years old, and 3% were 58 and above (Figure 5).

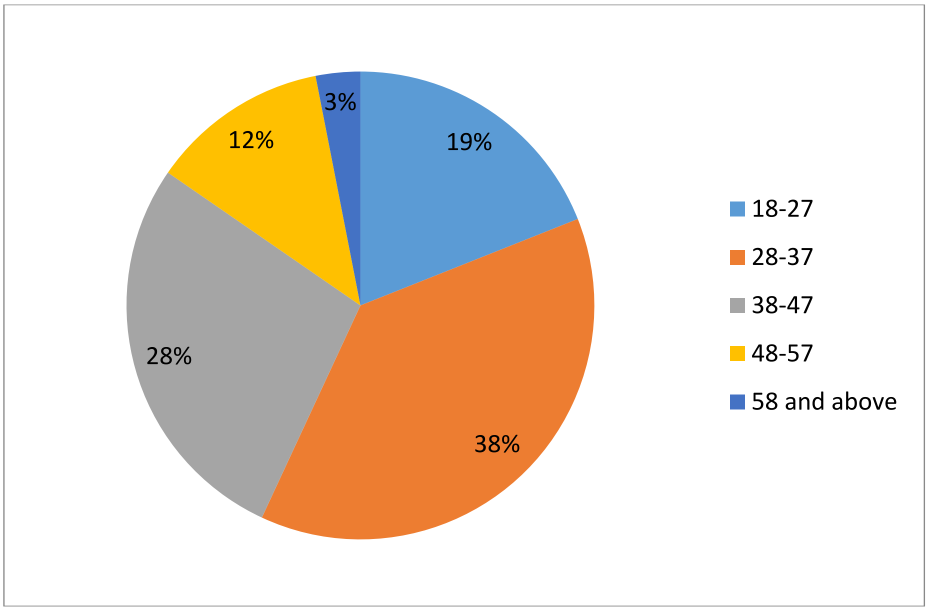

Figure 5: The participants' age

5.4.3 Level of education

The respondents that took part in the survey have all attained different levels of academic qualification (Figure 6). 1% of the participants had a PhD, 3% had an MSc, 26% had a BSc, 44% had a high school education, and 26% of them chose ‘others’ because some of them had no formal qualifications.

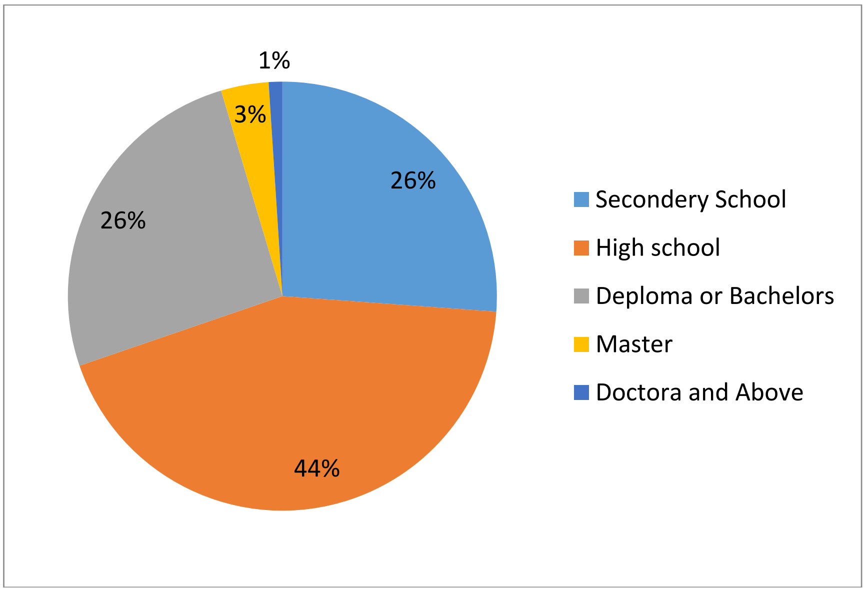

Figure 6: The participants' education level

5.5 Adverse impacts of construction on public people

5.5.1 What is the magnitude of noise caused due to execution of the construction activities?

As can be seen in Table 6, which indicates the percentages of each scale (very low, low, medium, high, very high), and also in Figure 7, the rate of noise according to the respondents was 16.5% very high, 39% high, 30% medium, 12% low, and 2% very low. This means that more than fifty percent of the participants indicated that the noise they experienced was either on a high or very high scale. In addition, of the 195 participants, 167 of them indicated a medium to very high rate of noise.

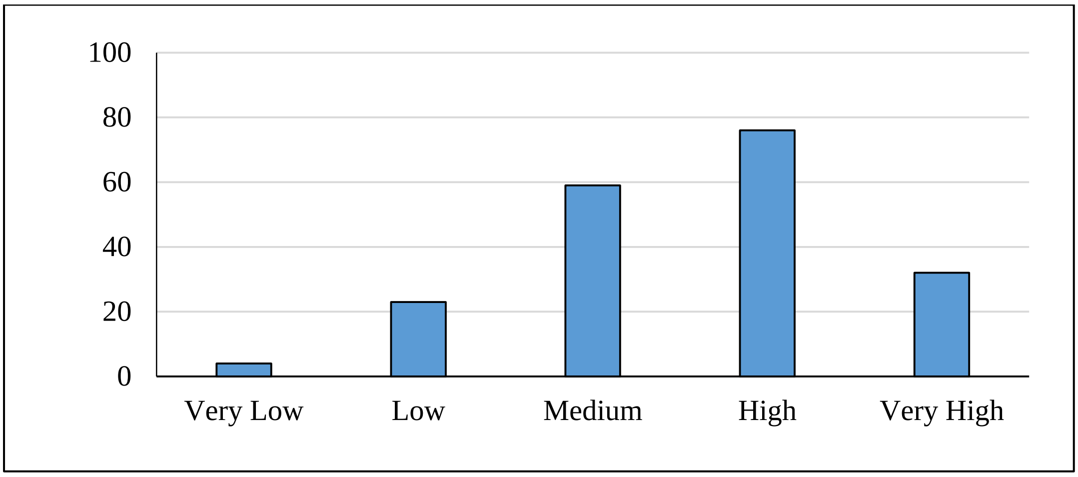

Figure 7: Rate of noise caused due to execution of the construction

Table 6: The output analysis from SPSS for noise rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	4	2.1	2.1	2.1
	Low	23	11.8	11.9	13.9
	Medium	59	30.3	30.4	44.3
	High	76	39.0	39.2	83.5
	Very High	32	16.4	16.5	100.0
	Total	194	99.5	100.0	
Missing	System	1	.5		
Total		195	100.0		

5.5.2 What is the magnitude of dust caused due to execution of the construction activities?

The percentages for respondents' rate of dust can directly be seen in Figure 8 as well as in Table 7. The rate of dust, as indicated by the respondents, was 13% very high, 42% high, 33% medium, 10% low, and 2% very low. Among the 195 participants, 87 of them indicated a high rate of dust.

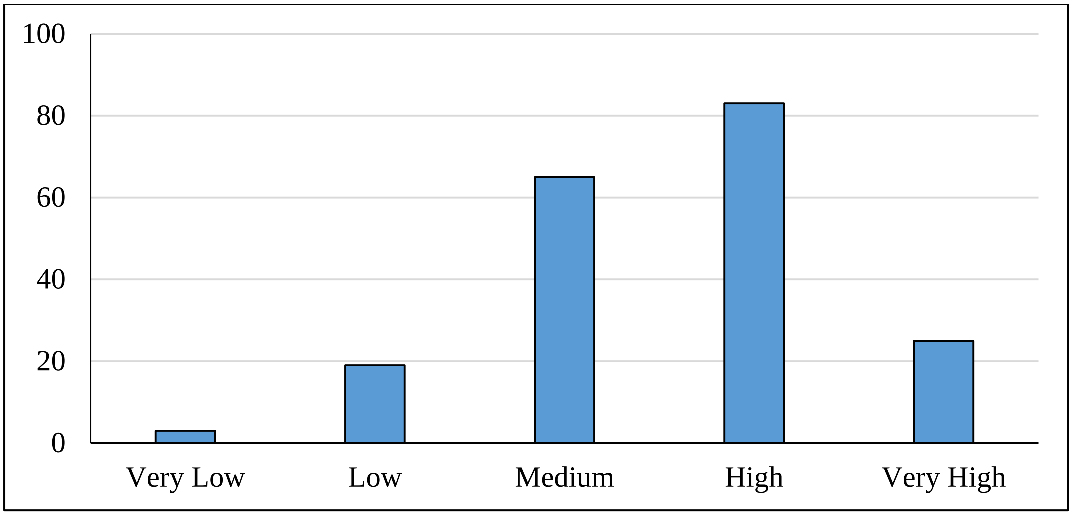

Figure 8: The rate of dust caused due to execution of the construction

Table 7: Output analysis from SPSS for dust rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	3	1.5	1.5	1.5
	Low	19	9.7	9.7	11.3
	Medium	65	33.3	33.3	44.6
	High	83	42.6	42.6	87.2
	Very High	25	12.8	12.8	100.0
	Total	195	100.0	100.0	

5.5.3 What is the magnitude of vibration caused due to execution of the construction activities?

Table 8 and Figure 9 show the percentage and number of respondents' responses to the rate of vibration. From both the table and the figure, it can be seen that 8% indicated a very high rate of vibration, 26% high, 45% medium, 18% low, and 3% very low low rates of vibration. Of the 195 participants, 77 indicated either a high or a very high rate of vibration.

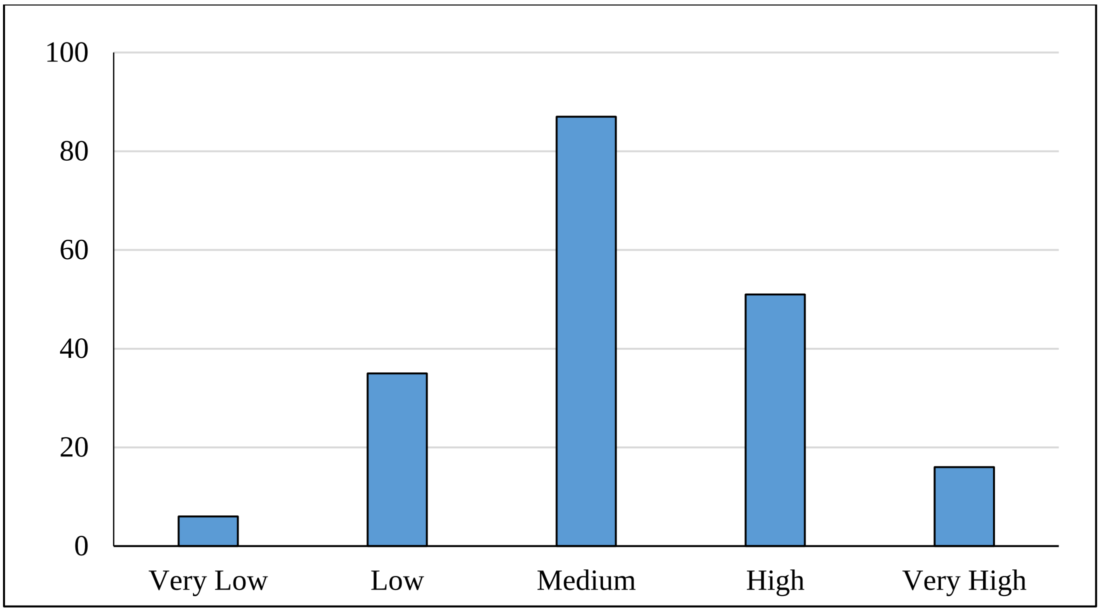

Figure 9: The rate of vibration caused due to execution of the construction

Table 8: Output analysis from SPSS for vibration rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	6	3.1	3.1	3.1
	Low	35	17.9	17.9	21.0
	Medium	87	44.6	44.6	65.6
	High	51	26.2	26.2	91.8
	Very High	16	8.2	8.2	100.0
	Total	195	100.0	100.0	

5.5.4 What is the magnitude of air pollution caused due to execution of the construction activities?

Figure 10 and Table 9 show the number of respondents and percentage rate of air pollution according to the respondents. 12% indicated a very high rate of air pollution, 32% high, 39% medium, 14% low, and 2% very low percentages of air pollution. 87 of the 194 respondents reported either a high or very high rate of air pollution.

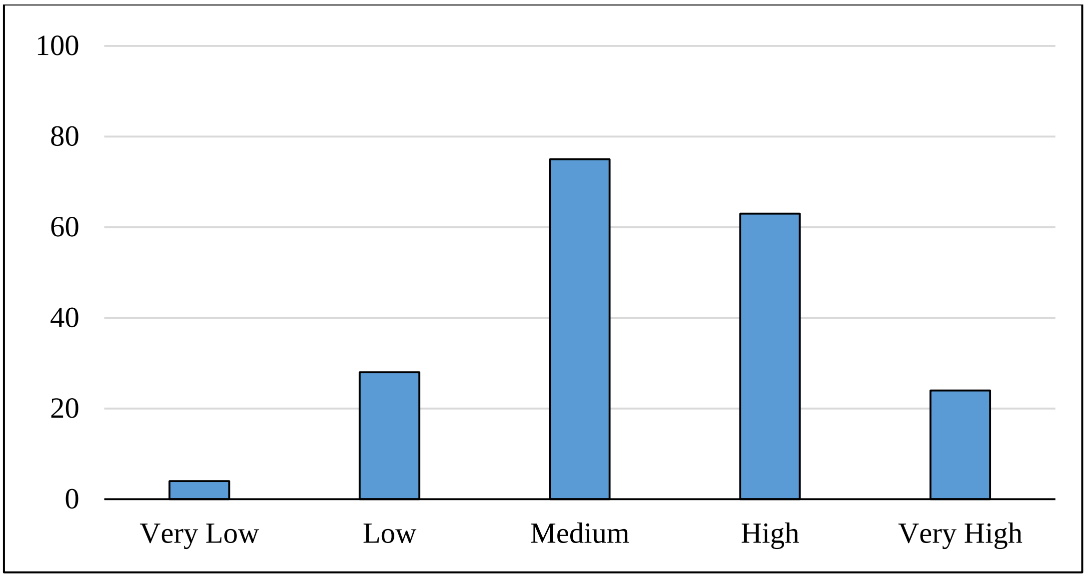

Figure 10: The rate of air pollution caused due to execution of the construction

Table 9: Output analysis from SPSS for air pollution rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	4	2.1	2.1	2.1
	Low	28	14.4	14.4	16.5
	Medium	75	38.5	38.7	55.2
	High	63	32.3	32.5	87.6
	Very High	24	12.3	12.4	100.0
	Total	194	99.5	100.0	
Missing	System	1	.5		
Total		195	100.0		

5.5.5 What is the magnitude of road closings that was caused due to execution of the construction activities?

Figure 11 and Table 10 show respondents' responses to the rate of road closings due to construction. 4% indicated a very high rate of road closings, 20% high, 45% medium, 28% low, and 5% a very low rate of road closing due to construction activities. Of the 195 respondents, 132 indicated a medium to very high rate of road closings.

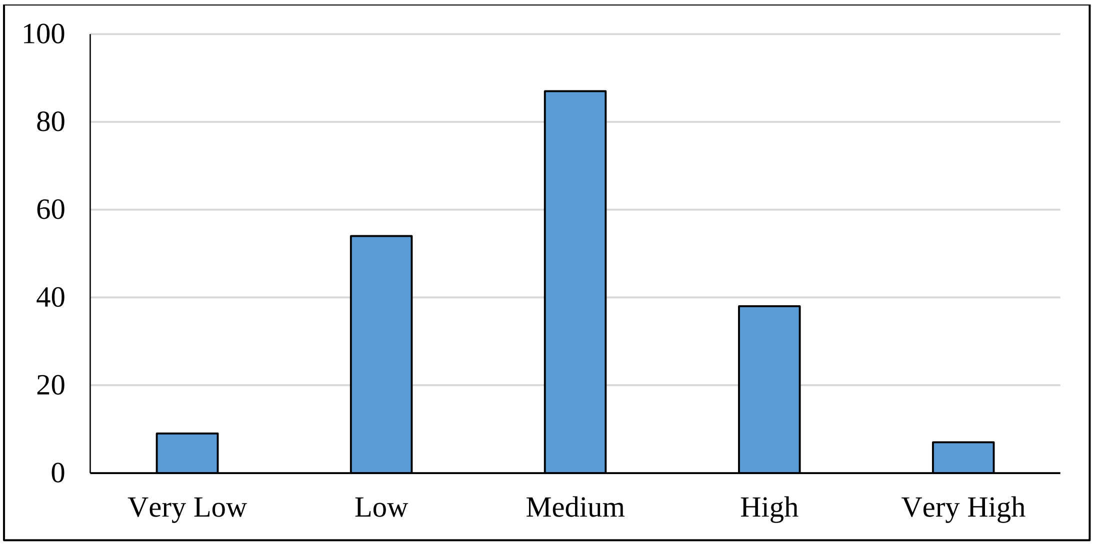

Figure 11: The rate of road closings that was caused due to execution of the construction

Table 10: Output analysis from SPSS for road closings rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	9	4.6	4.6	4.6
	Low	54	27.7	27.7	32.3
	Medium	87	44.6	44.6	76.9
	High	38	19.5	19.5	96.4
	Very High	7	3.6	3.6	100.0
	Total	195	100.0	100.0	

5.5.6 What is the magnitude of occurring detours that occurred due to the execution of the construction activities?

As can be seen in Table 11 and Figure 12 below, 0.5% of respondents indicated a very high rate of occurring detours due to construction, 20% high, 37% medium, 35% low, and 8% very low rate of occurring detours. In contrast, to majority of the other factors explored above, only one respondent indicated a very high rate of occurring detours, with the majority of respondents (141 of 195) indicating either a medium or low rate of occurring detours.

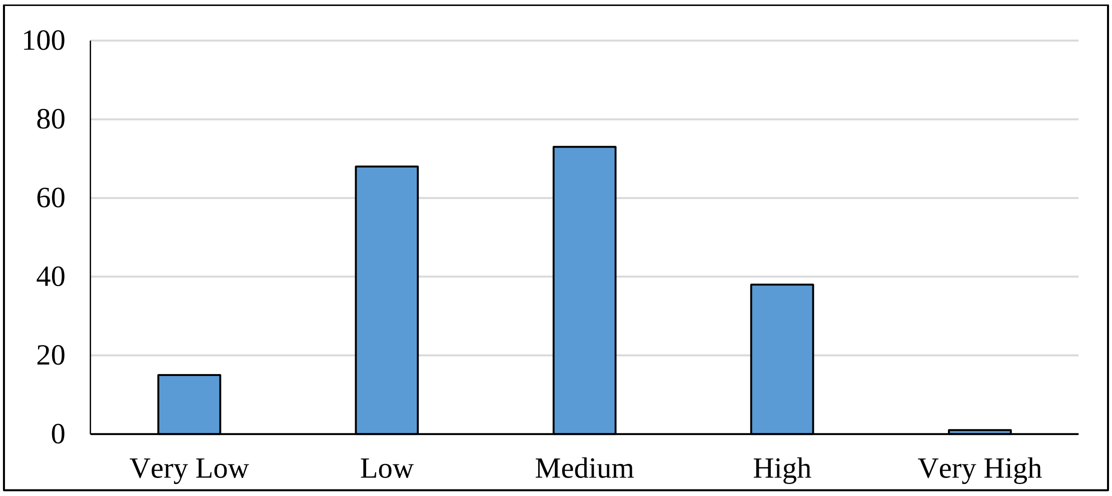

Figure 12: The rate of occurring detours that occurred due to the execution of the construction

Table 11: Output analysis from SPSS for occurring detours rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	15	7.7	7.7	7.7
	Low	68	34.9	34.9	42.6
	Medium	73	37.4	37.4	80.0
	High	38	19.5	19.5	99.5
	Very High	1	0.5	0.5	100.0
	Total	195	100.0	100.0	

5.5.7 What is the magnitude of utility cuts caused due to execution of the construction activities?

The number of respondents and the percentage of respondents' responses to the rate of utility cuts occurring as a result of construction can be seen in Table 12 and Figure 13 below. 17% indicated a high, 42% medium, 30% low, and 10% very low rate of utility cuts. Most strikingly, while none of the respondents indicated experiencing a very high rate of utility cuts, 34 of the 195 respondents indicated that they experienced a high rate of utility cuts.

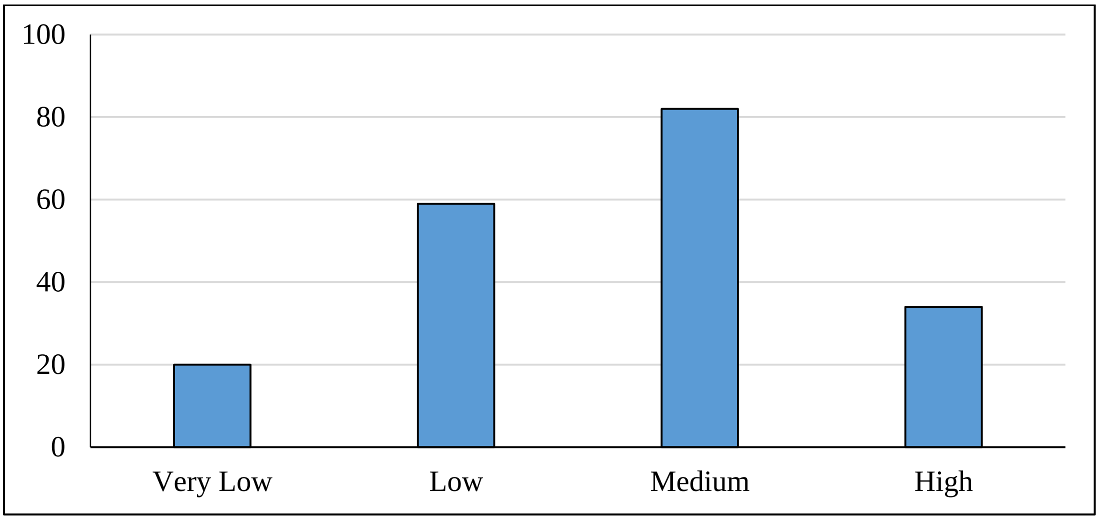

Figure 13: The rate of utility cuts caused due to execution of the construction

Table 12: The output analysis from SPSS for utility cuts rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	20	10.3	10.3	10.3
	Low	59	30.3	30.3	40.5
	Medium	82	42.1	42.1	82.6
	High	34	17.4	17.4	100.0
	Total	195	100.0	100.0	

5.5.8 What is the negative effect magnitude of quality of life caused due to execution of the construction activities?

Figure 14 and Table 13 show respondents' responses to the rate negative quality of life effects resulting from construction activities. 4% indicated a very high rate, 25% high, 44% medium, 25% low, and 3% very low rates of negative quality of life effects. While the majority of respondents (86 of 195) indicated only a medium rate of negative quality of life effects, 56 respondents claimed to have experienced either a high or very high rate of such negative effects.

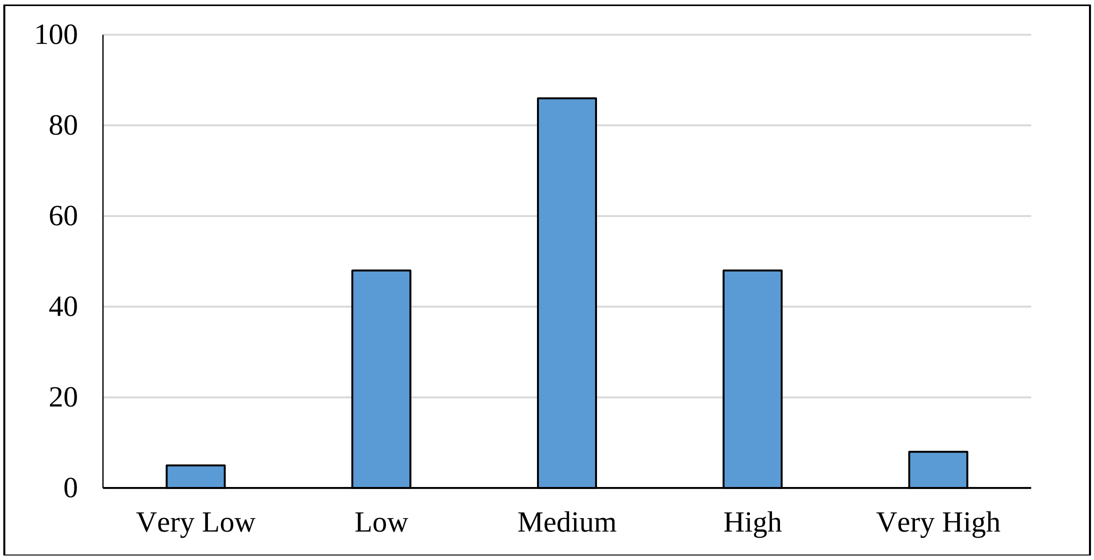

Figure 14: The negative effect rate of quality of life caused due to execution of the construction

Table 13: Output analysis from SPSS for negative effect rate of quality of life

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	5	2.6	2.6	2.6
	Low	48	24.6	24.6	27.2
	Medium	86	44.1	44.1	71.3
	High	48	24.6	24.6	95.9
	Very High	8	4.1	4.1	100.0
	Total	195	100.0	100.0	

5.5.9 What is the magnitude of surface disruption caused due to execution of the construction activities?

Figure 15 and Table 14 show respondents' responses to the rate of surface disruptions due to construction. 4% indicated a very high rate of surface disruptions, 48% high, 41% medium, 7% low, and 0.5% a very low rate of surface disruptions due to construction activities. Of the 195 respondents, 180 indicated a medium to very high rate of surface disruptions with nearly fifty percent claiming to have experienced a high rate of such disruptions.

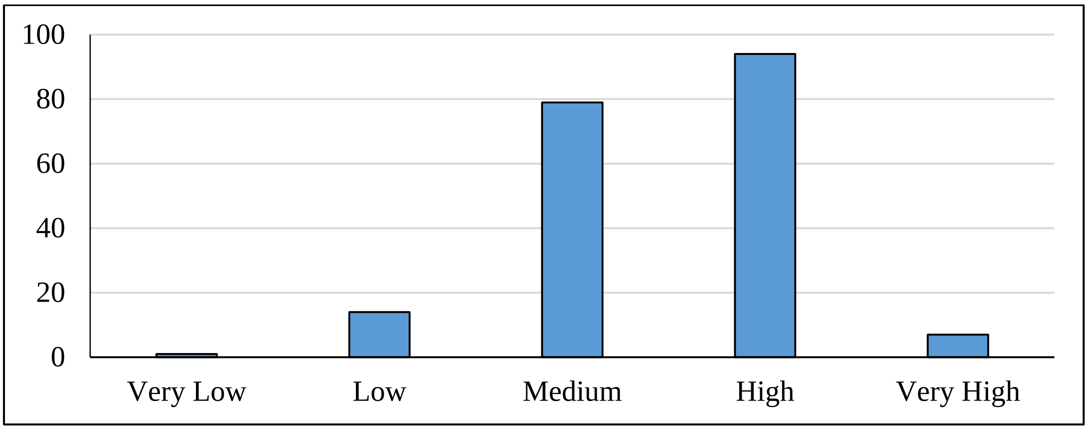

Figure 15: The rate of surface disruption caused due to execution of the construction

Table 14: Output analysis from SPSS for surface disruption rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	1	0.5	0.5	0.5
	Low	14	7.2	7.2	7.7
	Medium	79	40.5	40.5	48.2
	High	94	48.2	48.2	96.4
	Very High	7	3.6	3.6	100.0
	Total	195	100.0	100.0	

5.5.10 What is the magnitude of damaged facilities caused due to execution of the construction activities?

Figure 16 and Table 15 show the number of respondents and percentage rate of damaged facilities according to the respondents. 4% indicated a very high rate of damaged facilities, 20% high, 44% medium, 28% low, and 5% very low rates of damaged facilities. 131 of the 194 respondents reported a medium to very high rate of damaged facilities due to construction.

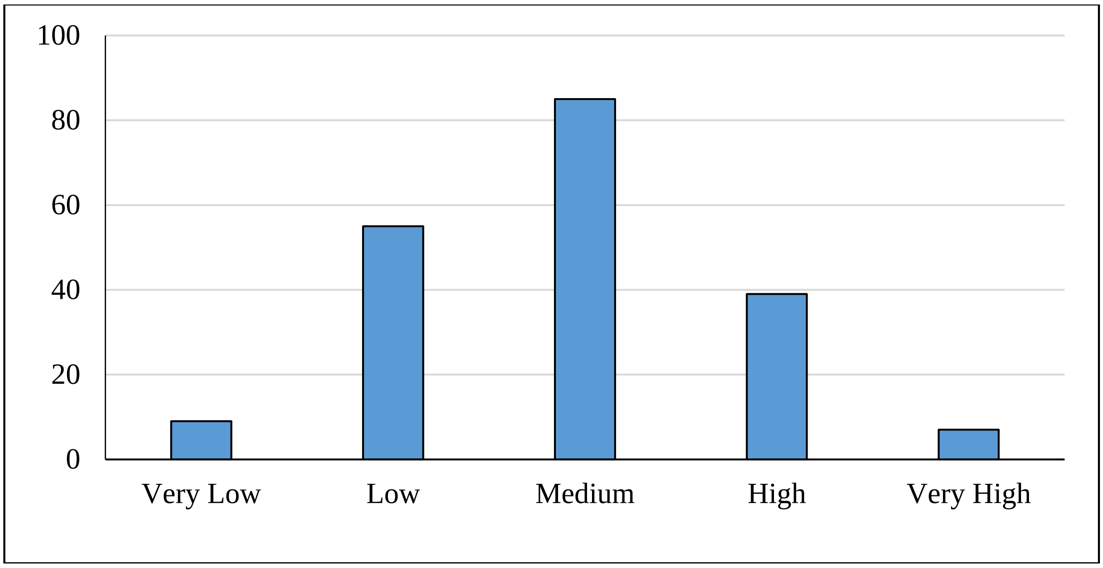

Figure 16: The rate of damaged facilities caused due to execution of the construction

Table 15: Output analysis from SPSS for of damaged facilities rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	9	4.6	4.6	4.6
	Low	55	28.2	28.2	32.8
	Medium	85	43.6	43.6	76.4
	High	39	20.0	20.0	96.4
	Very High	7	3.6	3.6	100.0
	Total	195	100.0	100.0	

5.5.11 Do the construction activities cause disruption of pedestrian place? If yes, what is the magnitude?

Table 16 shows the number of respondents who did and did not experience a disruption of pedestrian places due to construction. In the case of respondents that did experience such a disruption, it, in conjunction with Figure 17, shows the number and percentage of the rates of disruption. While none of the relevant respondents claimed to have experienced a very low rate of disruption of pedestrian activities, 7% indicated a very high rate of disruption, 49% high, 38% medium, and 6% low rate of disruption. The majority of respondents (103 of 183) indicated either a high or very high rate of disruption of pedestrian activities.

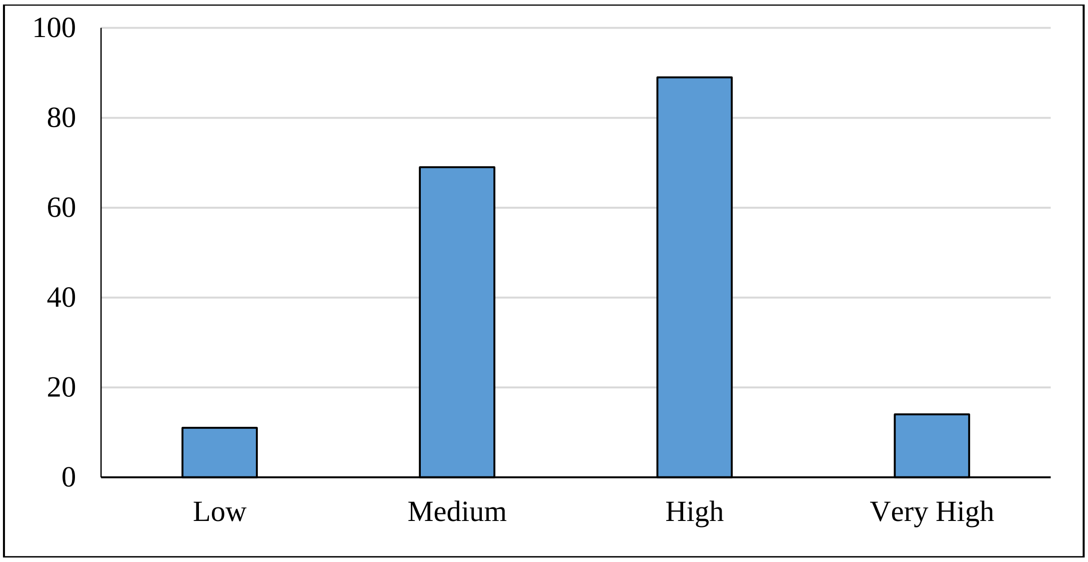

Figure 17: The rate of disruption of pedestrian place caused due to execution of the construction

Table 16: The output analysis from SPSS for disruption of pedestrian place rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	183	93.8	93.8	93.8
	No	12	6.2	6.2	100.0
	Total	195	100.0	100.0	
Valid	Low	11	5.6	6.0	6.0
	Medium	69	35.4	37.7	43.7
	High	89	45.6	48.6	92.3
	Very High	14	7.2	7.7	100.0
	Total	183	93.8	100.0	
Missing	System	12	6.2		
Total		195	100.0		

5.6 Analysis of interviews

According to the interview questions, the participants are divided into three categories. This was necessary as it is believed to contribute to a better understanding of the viewpoints and level of knowledge of participants regarding environmental impact assessment and construction social cost.

The first part interviewed with the employers who are responsible for collecting construction complains in the municipality in Erbil, Sulaymania and Duhok city. The second part of interview with the head of EIA department in directorate of environment for three major city include Erbil, Sulaymania and Duhok. The third part of interviews was with the construction company's managers, site engineers, environmentalist person in engineering bureau. All of environmentalists have an expert about the EIA report.

Figure 18 shows the interviewees participants 14% of the result came from the government members who actually play their part in the municipality of major cities. Same figure goes to the head of EIA department in directorate of environment. On the other hand, 33% of interviews were done with environmentalist person in engineering bureau. Interview with the construction company's managers, site engineers totally accounted for 38% of completed sessions.

The reason behind choosing these persons were that when public people have complains about projects directed they went to municipality for showing their critiques. The second part is the directorate of environment and it is the authority for approving environmental impact assessment report for projects. Environmentalist persons, contractors, site engineering are stakeholder for project.

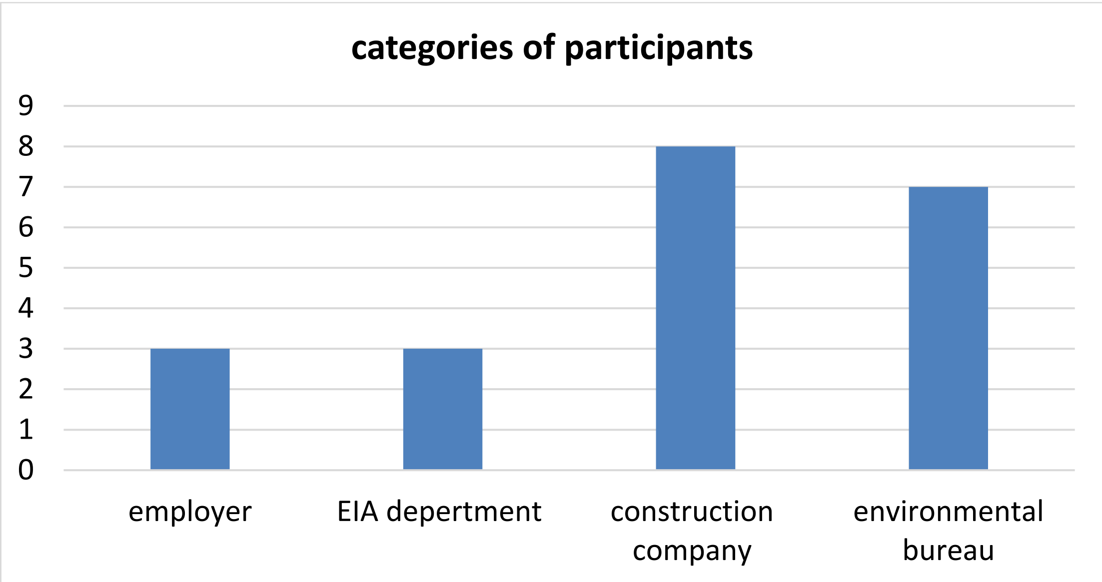

Figure 18: Categories of participants

5.6.1 Employer's interviews in municipalities

A. Complain from public people during construction in Northern Iraq.

Among the interviewees, 100% (3out 3) of the interviewees, including employers in municipality in three major cities reported that any construction project will not be finish without complains from public peoples. They mentioned that complains about traffic problems, noise, pollution and etc.as showed in the tables (17, 18, 19 and 20).

Table 17: Number of complains which comes from public people during construction in Sulaymania city

Years	Noise &vibration	pollution	Traffic problems	others	Total
2012	43	62	39	9	**153**
2013	32	36	48	12	**128**
2014	51	43	59	10	**163**
2015	64	39	61	6	**170**
2016	55	62	73	23	**213**

Table 18: Number of complains which comes from public people during construction in Erbil city

Years	Noise &vibration	pollution	Traffic problems	others	total
2012	53	61	43	12	**169**
2013	44	54	63	21	**182**
2014	52	49	57	19	**177**
2015	66	47	59	15	**187**
2016	57	61	69	9	**196**

Table 19: Number of complains which comes from public people during construction in Duhok city

Years	Noise &vibration	pollution	Traffic problems	others	total
2012	24	35	32	7	**98**
2013	35	22	19	11	**87**
2014	21	32	39	17	**109**
2015	41	43	27	9	**120**
2016	36	38	47	13	**134**

Table 20: Total number of complains which comes from public people during construction in Duhok, Sulaymania and Erbil

Years	**Sulaymania**	**Erbil**	**Duhok**
2012	153	169	98
2013	128	182	87
2014	163	177	109
2015	170	186	120
2016	213	195	134

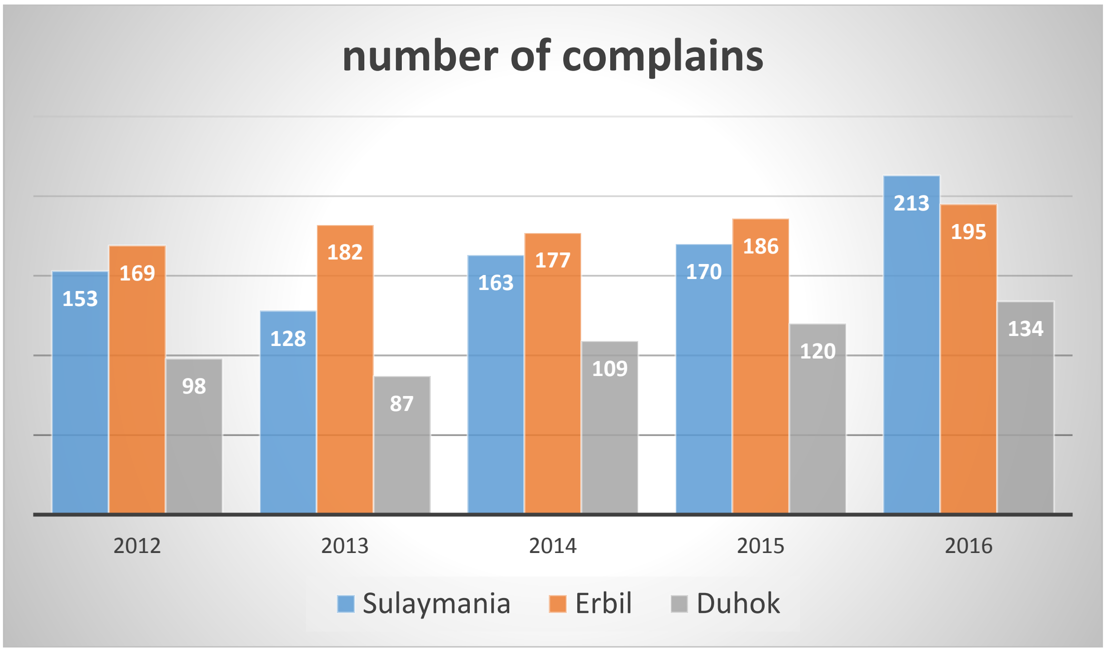

Figure 19: Total number of complains which comes from public people during construction

Depend on the complaint data last five years the number of complainant increased because adverse impacts associated with construction activities in construction phase increased as showed in figure 19.Complains about the traffic, noise, pollution, damage the site surroundings.

5.6.2 Interviews with head of EIA

A. When project proposed in which stage need to EIA in the system?

The participants in environmental impact assessment department stated that the EIA report is required in planning permission stage when the projects proposed. They said that as the local authority we assess the report and after approving the report projects will be start to construction.

B. What type of project need EIA report?

The participants stated that classifying the project bases on its potential environmental sensitivity determined the necessity and extent of an EIA. The classification of projects according to environmental impact is as follows in Northern Iraq:

Category A: Projects in this category are expected to have a diverse, unprecedented, and significant impact on the environment, such as factories. This type of projects should be fifteen kilometers from the population area and their impacts are more readily mitigated than in Category B.

Category B: These types include building construction projects which have potential adverse environmental impacts. The projects required EIA report if the area of project will be more than 1000 m2 or if the projects will be multistory building.

Category C: Projects in this category are expected to have little to no adverse effects on the environment. For This type of projects EIA report no required.

C. Who is committee give a proposal? And how assess the proposal?

The participants mentioned that each directorate of environment in cities has expert committee to preparing proposal. This committee consists of environmentalist person, chemists, and engineers. In addition, before starting construction the projects should prepare EIA report and approved by the committee. They stated that approving report depend on the criteria and our procedure will be done and also in this report should mention the mitigation measure and strategy for each negative effect and for solving problems during life cycle of projects.

D. What are the criteria that help you to assess?

The participants said that the criteria which use for approving EIA report include Buffers, Air pollution, Proximity, Water Pollution, Geology/Hydrology, Waste disposal /row materials ,Social /cultural, Land value ,Ecology, Geology/Hydrology, Risks of Toxic Clouds, Fire and Explosion, Waste disposal /row materials and Access.

E. Do you have standard format of EIA? If you have ,

F. Do you consider the social issue in EIA report?

The authorities have a standard format with the criteria and the procedure for the report but still they do not consider the social issue during construction in the EIA reports.

5.6.3 Stakeholders interview in construction companies and environmentalist persons.

A. Do you bring complain from public people during construction?

Among the interviewees, 87% (7out 8) of the interviewees, including_Construction stakeholders mentioned the several social problem have during construction like complains about the close the road, noise, disruption surrounding of projects and 37% (3 out 8) of the interviewees, mentioned that during construction occurring protest from public peoples specially in populated area.in addition 25% (2out 8) of the interviewees said that during construction because of complains and the social problems the project stopped for a limited days.

B. What is complains? Complains about what?

Among the interviewees, 100% (8out 8) of the interviewees mentioned that general complains were about close of roads, noise, pollution and 50% (4 out 8) of the interviewees said that complains about the vibration and time of activities like working in weekend and using machines before 8:00 am and also in the nights.

C. What is the criteria that you find a accept report?

The participants said that the criteria which use for approving EIA report is same with those criteria the authority determined include Buffers, Air pollution, Proximity, Water Pollution, Geology/Hydrology, Waste disposal /row materials ,Social /cultural, Land value ,Ecology, Geology/Hydrology, Risks of Toxic Clouds, Fire and Explosion, Waste disposal /row materials and Access.

5.7 Discussion of the results

According to the results of the questionnaire, all construction sites have a different rate of adverse impact on their surroundings, including: noise, dust, vibrations, air pollution, damaged facilities, surface disruption, utility cuts, and impacts on quality of life, disruption of pedestrian activities, road closings, and detours. The analyses shows that noise, dust, air pollution, disruption of pedestrian activity, and surface disruption are perceived as the most disturbing adverse impacts by the neighboring community during construction. It is also evident that every construction project will result in some level of social costs and consequently disturb the surrounding community. Therefore, construction companies needs to consider the construction social costs that could be produced by each of the goings-on in the projects, and carefully arrange the time-table of their activities.

According the interviews, municipality employees and stakeholders in Construction Company reported that hardly any construction project could be completed without complaints from the public. Also, based on the complaint data from the last five years, it is found that the number of complainants increased because the adverse impacts associated with construction activities in the construction phase also increased. These complaints included the closing of roads, noise, pollution, damage to the site surroundings, etc.

5.8 Environmental impact assessment (EIA) in Northern Iraq

The process of Environmental Impact Assessment is geared towards the identification, prediction, evaluation and communication of information regarding a proposed project's [potential environmental impact. Additionally, the EIA also outlines prospective mitigating measure before the approval and actualization of the project.

Environmental impact assessment is primarily a planning tool through which potential environmental issues from an action may be predicted, addressed, and prevented at the earlier planning and design stages in Northern Iraq.

General criteria relevant to all projects are as below:

- ***Buffers*****:** Particular kind's development projects, such as waste disposal facilities, waste handling facilities, and industrial projects, require the inclusion of buffer zones. Due to the high number of anticipated control problems, barriers may be provided in the form of aesthetically-pleasing trees, bushes, etc.
- ***Air pollution:*** Developers should always avoid situating a site in an area where the potential pollution will adversely affect the surrounding communities. A suitable location is one in which odor and air pollution are kept to a minimum. Potential health risks should also be accounted for in cases where either mutagenic or carcinogenic emissions are a possibility.
- ***Proximity****:* The site should be far from areas relatively more sensitive to its impacts, including hospitals, schools, nursing homes, and places of worship.
- ***Water Pollution:*** The placement of a facility close to a water source may result in its eventual degradation, and adversely impact critical uses downstream, such as intakes for public water supply, fisheries, or basic riverine livelihood. Project sites should avoid water catchment areas.
- ***Geology/Hydrology:*** The location of facilities (e.g. solid wastes landfills, scheduled wastes facilities, industries) must account for their capacity to detrimentally affect groundwater reserves.
- ***Risks of Toxic Clouds, Fire and Explosion:*** The placement of the facility should be such that the outer boundary of the buffer runs parallel to the maximum hazard distances.

- ***Waste disposal /raw materials***: The site should be located close to sources of essential raw materials and suitable facilities for disposing of the resulting waste should also be made available.
- ***Social /cultural***: Scenic and populated areas should be avoided. The participation of the public and consultation with relevant interest groups are necessary to get the acceptance of the locals and assess cultural impact.
- ***Access***: Site manages should avoid the use of all-weather roadways. The use of secondary roadways or streets should be avoided in providing easy access for raw material, product, and waste transport vehicles so as to avoid noise pollution and congestion on commuter routes.
- ***Land value:*** The placement of industrial facilities in a particular area would most likely affect land and property values. The type of land-use along the roadway leading up to the site and the level of residential activity in the surrounding area need to be taken into consideration.
- ***Ecology:*** Areas with unique habitats should be avoided. The placement of a plant in proximity to environmentally/ecologically sensitive habitats could have catastrophic repercussions for these habitats.

5.9 Environmental impact assessment process

Screening: The process of carrying out an EIA begins first with project screening. The purpose of this is to ascertain the need for an EIA and provided the answer is yes, the level of detail. The necessity of an EIA is determined by country-specific guidelines provided in the form of legislation, which also determines the screening and EIA criteria (Glasson et al., 2013).

The screening process results in an Initial Environmental Examination or Evaluation (IEE). The IEE is concluded by classifying the project based on its potential environmental sensitivity, which determines whether the EIA is necessary and to what extent. Environmental impact project classification in Northern Iraq is as follows:

> **Category A:** This category contains projects anticipated to significantly impact the environment in a sensitive, unprecedented, or diverse manner, such as factories. These type of projects should be fifteen kilometers away from population areas and heir effects are more easily mitigated than in Category **B.**
>
> **Category B:** This category includes building construction projects which have potential adverse environmental impacts. The projects required EIA report if the area of project will be more than 1000 m2 or if the projects will be multistory building.
>
> **Category C:** Projects in this category are expected to have minimal to no adverse environmental impacts. No EIA report is required for this type of projects.

Scoping: The terms of reference for the EIA are determined during this stage – aspects for consideration, groups and areas that require particular attention, things not to be considered in the EIA report and the management of the EIA process.

Appraisal: This stage involves a systematic appraisal of the potential impact, as well as the collection of evidence regarding them. It entails a detailed assessment of the prospective impact, range and significant, and a delineation of the potentially affected groups.

Mitigation measures: Implemented following the impact evaluation, they are geared towards the reduction of the scope and intensity of environmental impacts. Despite the possible cots that could be incurred, such measures are expected to increase the economic and environmental viability of the project.

Monitoring: The process of monitoring environmental impact and project implementation typically occurs over the course of the actual execution of the project. It is essentially a means through which stakeholders can ensure that the guidelines and recommendations outlined in the EIA are adhered to. As such, it may also be carried out after the project has been completed and remains extremely valued by environmental impact assessors.

Recommendations: This step involves the preparation of a negative impact assessment. Recommendations of the best course of action are made on the basis of the resulting report, including mitigation (negative impacts) and enhancement (positive impacts) measures.

5.10 Integrating construction social cost with environmental impact assessment

The integration process for environmental impact assessments and construction social costs start at the planning permission stage. The approach to integrate construction social costs with the environmental impact assessment report is intended to use just one group of consultants with both EIA and CSC skills to generate a comprehensive assessment that integrates both environmental impacts and construction social costs. In practice, the potential construction social costs of a project would be integrated into the overall environmental impact assessment for proposed projects. This approach is believed to provide the best means through which local communities can be influenced, and also affords greater opportunity to modify proposals, such that potential environmental impacts and construction social costs can be mitigated, while simultaneously enhancing the environmental and social benefits of a proposed project.

The approach is crucial because of the strong relationship between environmental issues and social impacts. The processes for carrying out environmental impact assessments and construction social costs share a number of similarities. As such, both environmental impact assessment and construction social cost practitioners are increasingly drawing on the other's approaches and value in the planning process to further enhance cooperation between them. Because of the structure and contents established for an EIA, CSC can easily work within the same process framework.

The key steps for integrating process:

Screening: The procedure of carrying out an environmental impact assessment begins first with project screening. The purpose of this step is to determine those projects which need environmental impact assessment reports and projects will be classified based on their potential environmental sensitivity. Also, to determine the construction social cost of a project, it is necessary to understand the activities and various dimensions of projects during construction. Projects normally involve quite a lot of activities and diverse components. Because numerous adverse impacts can result from each of the project's component activities, a detailed environmental impact assessment needs to consider the construction social costs that could be produced by each of the goings-on in the projects.

Scoping: It is crucial to ensure that all negative effects are considered in the scoping process because it is the most significant stage in an environmental impact assessment report. Scoping, in the integrated assessment, involves the process of identifying environmental concerns and construction social costs and thus, is carried out for each of the project's major activities. It is imperative that those who could potentially be affected by the project be informed as early as possible. Least of all, because of their knowledge and perspective could prove an important determinant for the focus of the environmental impact assessment itself.

While the local people might express concern over the likelihood of some potential (perceived) impact, it is quite possible that some of these do not actually materialize. Regardless, such concerns are still able to affect the feelings and behavior of the local people as they relate to the project. Consequently, it is necessary that there is a conscious effort to carefully engage those who have such concerns and ensure that they are aware that their concerns are indeed being taken into consideration.

Prediction and mitigation: Following the completion of the scoping process and the subsequent identification of the major potential impacts, the process of prediction – which itself is integral to the EIA – that can begin. The different major options likely to have been suggested either before or during the scoping stage may require individual prediction studies. The assessment and management of the construction social cost of a project, in addition to serving as a regulatory tool in deciding social impacts prior to the granting of a project license, is also used as a mechanism for impact prediction.

A vital outcome of the prediction stage would be recommendations geared towards mitigating potential construction social costs. These recommendations would also be integrated in the Environmental Impact Statement. The purpose of mitigation is to minimize or out-rightly avoid potential negative effects and integrate them into a comprehensive environmental management system where possible. Individual plans for mitigating the particular adverse impacts should be documented at every phase of the project. Additionally, mitigation aims to:

- provide more suitable alternative courses of action;
- improve a project's environmental and social benefits;
- evade, mitigate, or find solutions to adverse impacts; and

Table 21: Mitigation measures for construction social costs

Construction social costs	**Mitigation measures**
Noise	• Use of noise control measures like silencers, barriers, and enclosures. • Change time of activities
dust	• Buildings should be screened with suitable debris screens and sheets • Apply additional water for dust suppression in dry seasons. • Avoid dust-generating activities on windy days.
vibration	• Operate earthmoving equipment on the construction lot as far away from vibration-sensitive sites as possible. • Avoid vibratory rollers and packers near sensitive areas.

	• Avoid nighttime activities. People are more aware of vibration in their homes during the nighttime hours.
Air pollution	• Use water sprays to minimize dust from cutting equipment.
Road closing	• Construction materials should not be store or place on road.
detours	• Attempt to avoid and reduce occurrence of detours to its ultimate during construction.
Utility cuts	• During construction the contractor should take the issue in consideration
Negative effect quality of life	• Mitigating other criteria's directly loosening Negative effect of life quality.
Disruption of pedestrian	• The accessibility of pedestrians of all ages must be guaranteed during construction; including for those with various disabilities. • Public walkways adjoining the construction site shall also be kept free of trash and debris. • Work zones must be sufficiently barricaded to prevent entry by visually-impaired pedestrians.

Management plan: A management plan is a complex schedule of the steps necessary for the minimization or mitigation of any predicted adverse impacts revealed during the project implementation. The management plan provides an integrated set of activities and procedures to mitigate and manage both environmental impacts and construction social costs created by the project. Thus, the environmental impact assessment report should address everything relevant to the public and project teams should be aware that different parties are sensitive to different adverse impacts. In other words, the project teams should arrange their time-table for the construction tasks by considering the peace and quietude of the neighborhood, and also they make arrangements for all activities on site. Furthermore, the project teams should understand the demands of their neighboring community. For that purpose, they can arrange meetings with the neighboring community and gather their comments and opinions before initiating the project. They should keep communication with these parties throughout the project.

Monitoring: should be carrying out consistently over an extended period of time. Interruptions might cause the resulting data to be insufficient, thus hampering the ability to accurately determine the project's impact. The purpose of monitoring involves the provision of information necessary for the implementation of the project in such a way that its adverse impacts on people and the environment alike are kept at a minimum.

The monitoring section should provide:

a) A detailed description of and technical details pertaining to the monitoring measures, including: the measurement criteria, methods, measurement frequency, appropriate detection limits.
b) Procedures for monitoring and reporting to guarantee conditions necessitating the adoption of mitigation measures are determined early on and provide information on the progress and success of such measures.

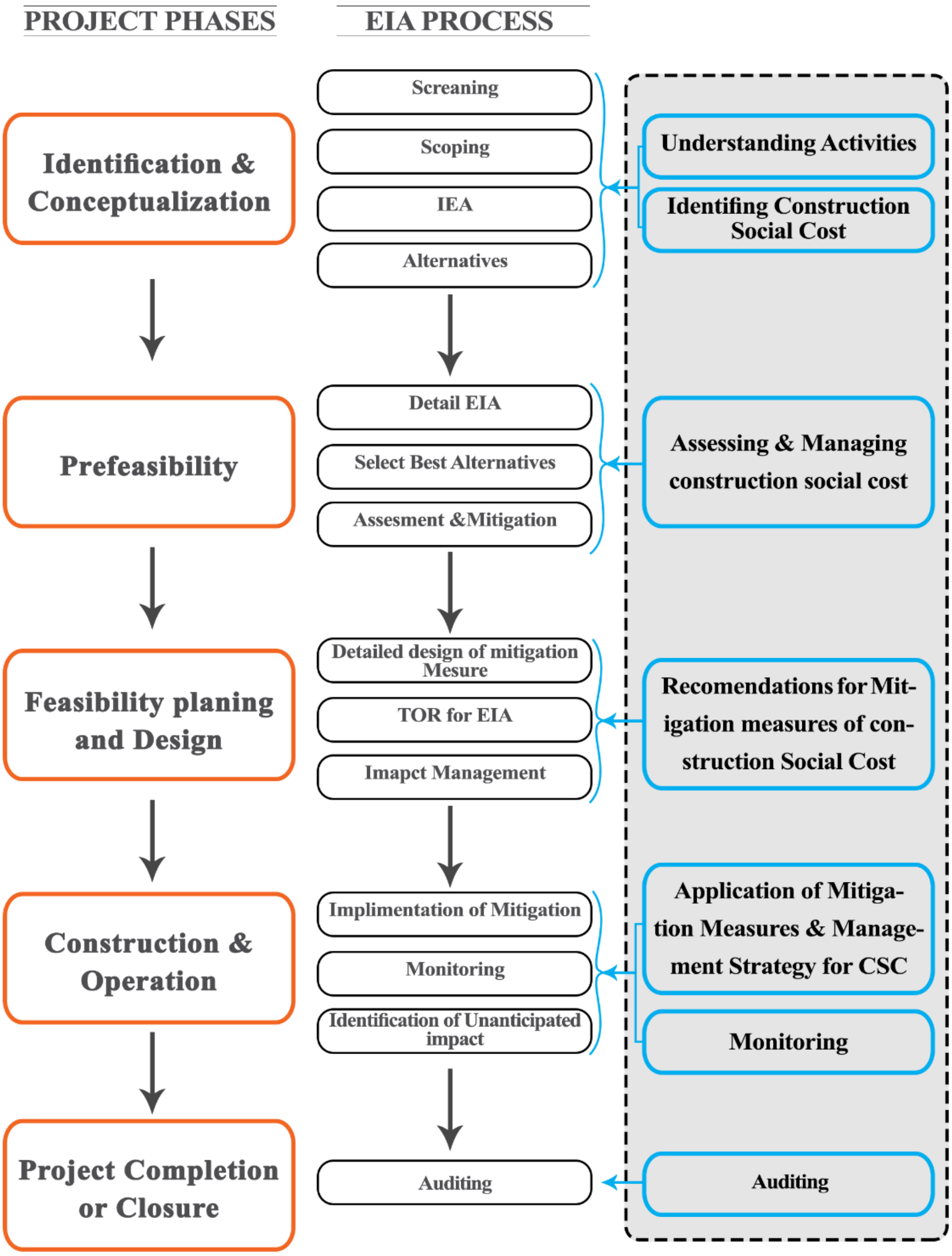

Figure 20: Integrated framework of environmental impact assessment and construction social costs

Chapter 6

CONCLUSION

Construction social costs are taken to refer to the process whereby the social dimensions of a project can be managed. An effect assessment of construction social costs needs extend from the inception of the project up until its completion. For that reason, this study aimed to evaluate the integrability of environmental impact assessment and construction social costs by providing an integrating framework that combines the biophysical and the social costs of impacts; we hope that this integration can join both forces for a better impact assessment.

Following a comprehensive review of the literature, an attempt was made at exploring social costs as they manifest in construction sites in residential areas. To this end, a questionnaire survey was conducted in North Iraq on 195 respondents. The survey pool was drawn from people residing within a 120 m radius of a construction site. The questionnaire results were analyzed by using SPSS statistics 22.

According to the results of the questionnaire, all construction sites have a different rate of adverse impact on their surroundings, including: noise, dust, vibrations, air pollution, damaged facilities, surface disruption, utility cuts, and impacts on quality of life, disruption of pedestrian activities, road closings, and detours. The analyses show that noise, dust, air pollution, disruption of pedestrian activity, and surface disruption are perceived as the most disturbing adverse impacts by the neighboring community during construction. It is also evident that every construction project will result in some level of social costs and consequently disturb the surrounding community. Therefore, construction companies ought to develop sustainable projects, and carefully arrange the time-table of their activities.

According the interviews, municipality employees and stakeholders in Construction Company reported that hardly any construction project could be completed without complaints from the public. Also, based on the complaint data from the last five years, it is found that the number of complainants increased because the adverse impacts associated with construction activities in the construction phase also increased. These complaints included the closing of roads, noise, pollution, damage to the site surroundings, etc.

The framework presented in this study provides a useful tool for the consideration of construction social costs in the conduct of an environmental impact assessment and thus, should be a subject of impact studies. This framework provides a link between the biophysical and social dimensions of construction impacts.

6.1 Recommendations for future studies

This study proposed a new framework: Assessing the integrability of environmental impact assessment and construction social costs. Future studies can develop other frameworks when environmental impact assessment and construction social costs can be integrated with sustainability in order to achieve more sustainable projects.

REFERENCES

Abowitz, D. A., & Toole, T. M. (2010). Mixed method research: Fundamental issues of design, validity, and reliability in construction research. *Journal of Construction Engineering and Management*, *136*(1), 108-116.

Ahmad, B., & Wood, C. (2002). A comparative evaluation of the EIA systems in Egypt, Turkey and Tunisia. *Environmental impact assessment review*, *22*(3), 213-234.

Akan, Z., Yilmaz, A., Özdemir, O., & Korpinar, M. A. (2012). Noise pollution, psychiatric symptoms and quality of life: noise problem in the east region of Turkey. *Journal of Inonu University Medical Faculty*, *19*(2), 75-81.

Allouche, E.N., Ariaratnam, S.T., AbouRizk, S.M. (2000). Multi-Dimensional Utility Model for Selection of a Trenchless Construction Method. Proceedings Construction Congress VI, February 20–22. ASCE, Orlando, FL. pp. 543–553.

Alshuwaikhat, H. M. (2005). Strategic environmental assessment can help solve environmenta impact assessment failures in developing countries. Environmental Impact AssessmentReview, 25(4), 307-317.

Amutha, S., & Ramganesh, E. (2013). empowerment of science teaching competence of b. ed. trainees in the rural areas through e-content with a metacognitive instructional design.

Apeldoorn, S. (2013). Trenchless versus traditional - comparing costs: SASTT. MIESA, 38(4), 55-57.

Azqueta, D. (1992). Social project appraisal and environmental impact assessment: a necessary but complicated theoretical bridge", in Development Policy Review, Vol. 10, pp. 255–270.

Bein, P. (1997). Monetization of Environmental Impacts of Roads, Ministry of Transportation and Highways: Victoria, British Columbia.

Bond, A. J., Viegas, C. V., Coelho, C. C. D. S. R., & Selig, P. M. (2010). Informal knowledge processes: the underpinning for sustainability outcomes in EIA? Journal of Cleaner Production, 18(1), 6-13.

Boyce, G. M., & Bried, E. M. (1998). Social cost accounting for trenchless projects. North American No-Dig, 98, 2-12.

Button, K.J. (1994). Overview of Internalising the social costs of Transport, Paris: ECMT/OECD, pp. 7-30.

Cashmore, M., Gwilliam, R., Morgan, R., Cobb, D., & Bond, A. (2004). The interminable issue of effectiveness: substantive purposes, outcomes and research challenges in the advancement of environmental impact assessment theory. Impact Assessment and Project Appraisal, 22(4), 295-310.

Celik, T. (2014). Developing a building construction associated social cost estimation system for Turkish construction industry (Doctoral dissertation, University of Salford).

Celik, T., & Budayan, C. (2016). How the Residents are Affected from Construction Operations Conducted in Residential Areas. *Procedia Engineering*, *161*, 394-398.

Chen Z., Li H. & Wong C.T.C. (2005). Environmental Planning: Analytic network process model for environmentally conscious construction planning. *Journal of Construction Engineering and Management*, 131(1), pp. 92-101.

Chung, S. S. & Poon, C. S. (1997). Quantifying externalities in solid waste management in Hong Kong. *Journal of Environmental Engineering*, 123, 282-289.

Conrad, C. C., & Hilchey, K. G. (2011). A review of citizen science and community-based environmental monitoring: issues and opportunities. Environmental monitoring and assessment, 176(1), 273-291.

Creswell, J. W. (2013). Qualitative inquiry and research design: Choosing among five approaches (3rd ed.).

Dainty, A. (2008) Methodological pluralism in construction management research. In: A. Knight and L.Ruddock (eds.), Advanced Research Methods in the Built Environment, Wiley-Blackwell, New York.

De Leo, G., & Levin, S. (1997). The multifaceted aspects of ecosystem integrity. *Conservation ecology*, *1*(1).

Dietz, T., York, R. & Rosa, E. (2001). Ecological Democracy and Sustainable Development, Paper presented at the 2001 open Meeting of the Human Dimensions of Global Environmental Change Research Community, Rio de Janeiro, Brazil, 8th October.

Dimen, L., & Ienciu, I. (2005). Environmental management plan. RevCAD *Journal of Geodesy and Cadastre,* 5, 271-274.

Ducoff, N. (2013). Six strategies to create a culture of accountability. [online] Strategies.com. Available at: http://www.strategies.com/blog/six-strategies-to-create-a-culture-of-accountability/ [Accessed 4 Apr. 2014].

Erin, B., Fowlie, M., Lemoine, D. & Reynolds, S.S. (2013). The economics of solar electricity. Annual Review of Resource Economics 5 (1): 387-426.

Ferguson, A. (2012). Qualitative Evaluation of Transportation Construction Related Social Costs and their Impacts on the Local Community. MsC, The University of Texas at Arlington.

Field, B.C. (1997). Environmental Economics: An Introduction, 2nd ed., Irwin/McGraw-Hill.

Flynn, D. (2003). Student Guide to SPSS: Obtido em.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2011). How to design and evaluate research in education (8th ed. Vol. 7): McGraw-Hill New York.

Gadgil, M. (2013). Research Project on Assessing Quality of Environmental Impact Assessment (EIA), Compliance of Environmental Clearance (EC) Conditions and Adequacy of Environmental Management Plan (EMP) of Mining Industry in Goa.

Gangolells, M., Casals, M., Gasso, S., Forcada, N., Roca, X., & Fuertes, A. (2009). A methodology for predicting the severity of environmental impacts related to the construction process of residential buildings. *Building and Environment*, *44*(3), 558-571.

George, C. K. (2002). *Basic principles and methods of urban and regional planning*. Libro-Gem Books.

Gilchrist, A. & Allouche, E. N. (2005). Quantification of social costs associated with construction projects: state-of-the-art review. Tunnelling and Underground Space Technology, 20, 89-104.

Glasson, J., Therivel, R., & Chadwick, A. (2013). *Introduction to environmental impact assessment*. Routledge.

Gobinath, B. G., Prabhakaran, N., & Rajeshkumar, K. (2010). Modified EIA for small and medium projects-An effective method to make the projects Eco-friendly. *International Journal of Environmental Sciences*, 1(1), 55.

Greene, J. C. (2007). Mixed methods in social inquiry. San Francisco: Jossey-Bass.

Gunter, M. M. (2011). Economic opportunities in Iraqi Kurdistan. *Middle East Policy*, Vol. XVIII, No. 2.

Guoqing, S., Shaojun, C., 2004. Analysis on social impact in water conservancy and hydropower development. UNHYDRO. UN Symposium on Hydropower & Sustainable Development(UNHYDRO), Chinese National Committee on Large Dams, Beijing, pp. 1–8.

Harwell, M. R. (2011). ReseaRch Design in Qualitative/Quantitative. The Sage handbook for research in education: Pursuing ideas as the keystone of exemplary inquiry, 147.

Herbsman, Z. J. & Glagola, C. R. (1998). Lane rental-innovative way to reduce road construction time. *Journal of Construction Engineering & Management*, 124 (5), 411-417.

Hunt, D., Nash, D. & Rogers, C. (2014). *Sustainable utility placement via Multi-Utility Tunnels.* Tunnelling and Underground Space Technology, vol 39, pp. 15-26.

Ijigah, E. A., Jimoh, R. A., Aruleba, B. O., & Ade, A. B. (2013). An Assessment of Environmental Impacts of Building Construction Projects. Civil and Environmental Research, 3(1), 93-104.

International Association for Impact Assessment-IAIA (2000). The reviewed Act of Impact Assessment, IAIA London.

Jay, S., Jones, C., Slinn, P., Wood, C., 2007. Environmental impact assessment: restrospect and prospect. Environ. Impact Assess. Rev. 27, 287e300. http://dx.doi.org/10.1016/j.eiar.2006.12.001.

Jiang, Y. (1999). A Model for Estimating Excess User Costs at Highway Work Zones. Transportation Research Record: Journal of the Transportation Research Board, Vol. 1657, No. -1, 31-41.

Lee, E. B., Ibbs, C. W., and Thomas, D. (2005). Minimizing Total Cost for Urban Freeway Reconstruction with Integrated Construction/Traffic Analysis. *Journal of infrastructure systems*, Vol. 11, No. 4, 250-257.

Lee, N. and George, C. 2000. Environmental Assessment in Developing and Transitional Countries: Principles, Methods, and Practice. John Wiley and Sons Ltd. Chichester. England.

Leedy, P. & Ormrod, J. (2001). Practical research: Planning and design (7th ed.). Upper Saddle River, NJ: Merrill Prentice Hall. Thousand Oaks: SAGE Publications.

Leedy, P. D. (1993). Practical research: planning and design. New Jersey: Prentice-Hall.

Li X., Zhu Y., Zhang Z. (2010). "An LCA-based environmental impact assessment.

Love, P. E.D., Holt, G. D., Li, H. (2002) Triangulation in construction management.

Lund, T. (2012). Combining qualitative and quantitative approaches: Some arguments for mixed methods research. *Scandinavian journal of educational research, 56*(2), 155-165.

Mack, N., Woodsong, C., MacQueen, K. M., Guest, G., & Namey, E. (2005). Qualitative research methods: a data collectors field guide.

Majumdar, M. (2006). Energy Efficiency in Green Buildings- An Integrated Approach to Building Design. Green Business Directory; CII-Godrej GBC. The Energy and Resource Institute, Habitat Place, New Delhi, 110 003.

Manchester Airport (2013). Mitigation Schemes [Online]. Available at: <http://www.manchesterairport.co.uk/manweb.nsf/Content/mitigationschemes> [Accessed 21.05.2013].

Mao, L. Z., Zhu, H. G., & Duan, L. R. (2012). The Social Cost of Traffic Congestion and Countermeasures in Beijing. In Ninth Asia Pacific Transportation Development Conference, ASCE, 29 June- 1 July, Chongqing, China.

Matthews, J. C., & Allouche, E. N. (2010). A social cost calculator for utility construction projects. *North American Society for Trenchless Technology Paper F-4-03*.

McKim, R. A. (1997). Bidding strategies for conventional and trenchless technologies considering social costs. *Canadian journal of civil engineering*,24(5), 819-827.

McKim, R. A., & Kathula, V. S. (1999). Social costs and infrastructure management. *Proceedings of INFRA 99 International*.

Morgan, R. K. (2012). Environmental impact assessment: the state of the art. *Impact Assessment and Project Appraisal*, *30*(1), 5-14.

Ofori, G., Briffett, C., Gang, G. & Ranasinghe, M. (2000). „Impact of ISO 14000 on construction enterprises in Singapore", in Construction Management and Economics, Vol. 18, pp. 935–947.

Ogola, P. F. A. (2007). Environmental impact assessment general procedures. Short Course II on Surface Exploration for Geothermal Resources, organized by UNUGTP and KenGen, at Lake Naivasha, Kenya, 2-17.

Ormsby, C. (2009). A Framework for Estimating the Total Cost of Buried Municipal Infrastructure Renewal Projects. MEng, Department of Civil Engineering and Applied Mechanics, McGill University, Montreal.

Panigrahi, J. K., & Amirapu, S. (2012). An assessment of EIA system in India. Environmental Impact Assessment Review, 35, 23-36.

Porkodi, S., & Valarmathi, S. (2015). Environmental Impact Assessment for Infrastructure Development project in Chennai. *International Research journal of Engineering and Technology* (IRJET) Vol.2, 2395-0056.

Pucker, J., Allouche, E., & Sterling, R. (2006). Social costs associated with trenchless projects: Case histories in North America and Europe. North American Society for Trenchless Technology No-Dig.

Rahman, S., Vanier, D. J., & Newton, L. A. (2005). MIIP Report: Social Cost Considerations for Municipal Infrastructure Management. National Research Council Canada: Ottawa.

Read, G. F., & Vickridge, I. (2004). Social or indirect costs of public utility works. *Sewers: Replacement and New Construction*, 339. Research. Eng., Construction and Architectural Mgmt, Vol. 9, No: 4, pp. 294-303.

Rubin, E.S. & Davidson, C.T. (2001). Introduction to Engineering and Environment.

Selvakumar, S., & Jeykumar, R. K. C. (2016). Environmental Impact Assessment for Building Construction Projects (Doctoral dissertation, Anna University).

Shetty, A., & Kumar, S. (2013). Environmental Impact Assessment and Environmental Management Plan for a Multi-level Parking Project–A Case Study. Exchange, 2013.

Slootweg, R., & Kolhoff, A. (2003). A generic approach to integrate biodiversity considerations in screening and scoping for EIA. Environmental Impact Assessment Review, 23(6), 657-681.

Soderberg, N. E., & Phillips, D. L. (2015). State-Building in Iraqi Kurdistan. *Institute for the Study of Human Rights*.

Slootweg, R., & Kolhoff, A. (2003). A generic approach to integrate biodiversity considerations in screening and scoping for EIA. *Environmental Impact Assessment Review*, *23*(6), 657-681.

Taylor, C., Bryan, C., & Goodrich, C. (2004). Social Assessment:Theory, Process and Techniques. (Third Ed.). Christchurch: Taylor Baines & Associates.

Teo, M. & Loosemore, M. (2001). A theory of waste behaviour in the construction industry. Construction Management & Economics, 19, 741-751.the construction process of residential buildings". Building and Environment UN-

Habitat (2006). The Global Campaign on Urban Governance. Concept paper, www.unhabitat.org Retrieved (21/07/ 2011).

UNISDR. (2005). Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. Extract from the final report of the World Conference on Disaster Reduction (A/CONF.206/6).

Wang, R. (2011). Autos, transit and bicycles: Comparing the costs in large Chinese cities. Transport Policy, 18(1), 139-146.

Watkins, L. H. (1980). Some Research into the Environmental Impact of Roads and Traffic. In Transport Research for Social and Economic Progress. Proceedings of the Second World Conference on Transport Research.

Williams, C. (2011). Research methods. *Journal of Business & Economics Research (JBER)*, *5*(3).

Wolcott, H. T. (2009). Writing up qualitative research (3rd ed.). Thousand Oaks, CA: Sage.

Wong, E. O., & Yip, R. C. (2004). Promoting sustainable construction waste management in Hong Kong. *Construction Management and Economics*, *22*(6), 563-566.

Wood, C. (2000). Screening and scoping. *Environmental Assessment in Developing and Transitional Countries*, 71-84.

Wood, C. (2003). *Environmental impact assessment: a comparative review*. Pearson Education.

Wood, G., & Becker, J. (2005). Discretionary judgement in local planning authority decision making: screening development proposals for environmental impact assessment. *Journal of Environmental Planning and Management*, *48*(3), 349-371.

Woodroffe, N. J., & Ariaratnam, S. T. (2008). Cost and risk evaluation for horizontal directional drilling versus open cut in an urban environment. *Practice periodical on structural design and construction*, *13*(2), 85-92.

World Bank 1999: Operational Policy OP 4.01 Annex C: Environmental Management Plan, World Bank Washington DC.

World Business Council for Sustainable Development, (2005): Environmental and social impact assessment (ESIA) guidelines.

Woskie, S. R., Kalil, A., Bello, D. & Virji, M. A. (2002). Exposures to quartz, diesel, dust, and welding fumes during heavy and highway construction. *AIHA Journal*, 63, 447-457.

Yu, W. D. & Lo, S. S. (2005). Time- dependent construction social costs model. Construction Management and Economics, 23, 327-337.

Yuan, Q. M., Cui, D. J., & Jiang, W. (2013). Study on evaluation methods of the social cost of green building projects. *Advances in Industrial Engineering, Information and Water Resources, WIT press: Southampton*, 11.

APPENDICES

Appendix A: Questionnaire

1) What is the magnitude of noise caused due to execution of the construction

Activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
…………………………………………………………………………………………

2) What is the magnitude of dust caused due to execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
…………………………………………………………………………………………

3) What is the magnitude of vibration that is caused due to the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
…………………………………………………………………………………………

4) What is the magnitude of air pollution that is caused due to the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
…………………………………………………………………………………………

5) What is the magnitude of road closings caused by the execution of construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High

6) What is the magnitude of Occurring Detours caused due to the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
……………………………………………………………………………………….

7) What is the magnitude of Utility cuts that have been caused due to the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
……………………………………………………………………………………….

8) What is the magnitude of negative effects on Quality of life that has been caused by the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High

………………………………………………………………………………………..

9) What is the magnitude of Surface disruption caused due to the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
……………………………………………………………………………………….

10) What is the magnitude of Damage to facilities that is caused by the execution of the construction activities?

☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High
……………………………………………………………………………………..

11) Do the construction activities cause a disruption of pedestrian places?

☐ Yes ☐ No
If yes, to what degree?
☐ Very Low ☐ Low ☐ medium ☐ High ☐ Very High

Appendix B: Interview questions

For Environmental Impact assessment department

1) When project proposed in which stage project need to EIA report in the system?
2) What type of project need EIA?
3) Who is committee give a proposal? And how assess the proposal?
4) What are the criteria that help you to assess?
5) Do you have standard format of EIA?
6) Do you consider the social issue in EIA report? What is the consideration?

For municipality

1) Do you bring complain from public people? During construction
2) What is complains? Complains about what?

For construction company

1) Do you bring complain from public people during construction?
2) What is complains? Complains about what?
3) What is the criteria that you find a accept report?
4) When you prepared the EIA which parameter you focused on?