Multi-Jurisdictional Analysis of Integration of Climate Change Considerations in Regulations and Guidelines Across 16 Environmental Impact Assessment (EIA) Regimes

By: Rose Mayembe MYMROS001

Thesis Submitted in Partial Fulfillment of MSc in Climate Change and Sustainable Development

Department of Environmental & Geographical Science African Climate & Development Initiative University of Cape Town

Supervisor: Dr Marieke Norton

Co-Supervisors: Dr Nicholas P. Simpson & Olivia Rumble

September 2022

DECLARATION

I know the meaning of plagiarism as set out by the standards established by the University of Cape Town for dissertations and declare that all the work in this document is my own and material drawn from other authors is properly acknowledged using the UCT/Harvard referencing format.

Signed by candidate

…………………………

05th September 2022

ABSTRACT

The contribution of the human activities to climate change is well understood. Yet integration of climate change considerations in tools designed to govern activities affecting the environment, such as Environmental Impact Assessment (EIA), remains underdeveloped and inconsistently applied. There is no clear direction on what measure of consideration is sufficient for environmental decision-making on potential impacts on the climate for proposed policies, programs, plans and projects. This research reviews progress across a range of 16 EIA regimes and outlines the potential for integration of climate change considerations in EIA. The research used a desk review of EIA literature to identify and assess regulations and guidelines that have been established to promote the integration of climate change in EIA. A typology of levels of integration was developed to guide analysis across multiple EIA regimes. The findings identify a global and growing normative expectation for climate change considerations to be integrated into EIA and describe the range of ways this is done across the regimes selected. Climate change integration in EIA is typically concerned with climate change mitigation, specifically greenhouse gas emissions from proposed developments. Fewer regimes are concerned with climate change adaptation, and in general, an integration deficit is identified for regimes where climate change is partially considered. Several challenges to integrating climate change in EIA are identified, including lack of practice guidelines and regulatory frameworks. Reflecting on the variety of approaches, the discussion extends typologies of integration in EIA to examine and provide a better understanding of substantive consideration of climate change in EIA. Examples of high integration indicate that EIA holds potential to play a substantive role in environmental governance at project level decision making affecting climate change. However, the range of examples also cautions that many domestic obstacles can militate against integration including political, socio-technical, and economic imperatives – particularly those affecting sectoral and scope exclusions. Nevertheless, developments across some regimes indicate leverage points for greater integration, including the role of EIA review to establish new precedents for the relevance of climate change to EIA. Potential future research and practice directions are identified, including development of regulations and practice guidelines, inclusion of climate change adaptation aspects, strengthening post-decision monitoring, application to all relevant sectors and activities, alignment with SEA, and integration across all stages of the EIA process

Keywords**:** climate change, EIA, mitigation, adaptation, integration

ACKNOWLEDGEMENT

First, I thank God for his everlasting grace, mercy, and provision during what ended up being one of the roughest times of my life.

My sincere appreciation goes to my ever-supporting co-supervisor, Dr Nicholas Philip Simpson, for his voluminous and invaluable guidance and for his enduring patience and constant availability while supervising me. I would also like to thank him for introducing me to exciting new concepts and ideas throughout the course of this research. Likewise, I cannot quantify the contributions and support of my co-supervisor, Olivia Rumble. I hold her comments and encouraging words close to my heart, they are more than light to my path. Importantly, to my friendly course convener and supervisor, Dr Marieke Norton, your words of hope and encouragement were invaluable, especially during challenging times. I am grateful to you.

Gratefully, I owe a debt of gratitude to my family for always being there for me, a one in a million-support system.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONMYS

ACT	Australian Capital Territory
CARICOM - SPREP	Caribbean Community – Secretariat of the Pacific Regional Environment Programme
CIPPP	Coal Baseload Independent Power Producers Procurement Programme
CO2	Carbon Dioxide
CEAA	Canadian Environmental Assessment Act
CEAA	Canadian Environmental Assessment Authority
CEQ	Council on Environmental Quality
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
EFS	Environmental and Social Framework
EIA	Environmental Impact Assessment
ESS	Environmental and Social Standards
ELAW	Environmental Law Alliance Worldwide
EMCA	Environmental Management and Co-ordination Act
EMP	Environmental Management Plan
EPA	Environmental Protection Act
EPA	Environmental Protection Agency
EPL	Environmental Protection Law
EU	European Union
FPTCCCEA	Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment
GHG	Greenhouse Gases
IAIA	International Association for Impact Assessment
IISD	International Institute for Sustainable Development
IEA	International Energy Agency
IEMA	Institute of Environmental Management and Assessment
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
Mt CO2	Metric Tonnes of Carbon Dioxide Equivalent
MW	Megawatt
NCEA	Netherlands Commission on Environmental Assessment
NDC	Nationally Determined Contributions
NEMA	National Environmental Management Act
NEPA	National Environmental Policy Act
NT	Northern Territory (Australia)
PS	Performance Standards
SEA	Strategic Environmental Assessment
SDG	Sustainable Development Goals
ToR	Terms of Reference
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
WA	Western Australia
WB	World Bank

1 INTRODUCTION

Radical reduction of greenhouse gas (GHG) emissions and the development of climate-resilient infrastructure across major sectors, such as energy, transportation, and water, is required to avoid severe and potentially catastrophic climate impacts related with projected and current climate change. Across the world, such actions need to go beyond emissions reduction and contribute towards adaptation building towards a just and resilient transition (Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016; UNEP, 2020). As many development-related activities requiring environmental impact assessment (EIA) are likely to contribute towards climate change, regulations and tools for environmental decision-making that mainstream climate change can play a key role in environmental governance and climate action (Ulibarri & Han, 2022; van der Bank & Karsten, 2020).

If considered well, EIA holds the potential to anticipate climate-related impacts from a project or anticipate the project's vulnerabilities, including ways of mitigating and adapting to climate change, reduce exposure and vulnerability, while facilitating climate literacy and the climate-proofing of various projects (Byer et al., 2012; Hands & Hudson, 2016; Loza & Fidélis, 2021; Sok, Boruff & Morrison-Saunders, 2011). Despite these potential merits, the potential of mainstreaming climate change mitigation and adaptation into EIA practice has remained largely underexplored. In practice, it requires climate change considerations to have a systematic and substantive influence in the EIA decision-making (Hands & Hudson, 2016; Sok, Boruff & Morrison-Saunders, 2011). It also requires enabling environmental regulations that explicitly link climate change to EIA (Gao, 2018; Matemilola et al., 2019; van der Bank & Karsten, 2020), and practitioner guidelines on how to go about it (Sok, Boruff & Morrison-Saunders, 2011).

Climate change has presented significant challenges to EIA. For some examples, the direct contribution of an individual proposed development to climate change is rarely identifiable before implementation (European Commission, 2013; Gao, 2018), integrating uncertainty language used in climate science (Byer et al., 2012), inconsistent interpretation of the scope of relevant impacts (Jiricka-Purrer et al., 2016), scoping appropriate time-window (Yi & Hacking, 2012), climate model downscaling (Jiricka-Purrer et al., 2016), and lack of regulatory provisions and practitioner guidance (Field, 2021; Matemilola et al., 2019; Sok, Boruff & Morrison-Saunders, 2011). There is a wide variation of procedural and substantive expectations, including EIA regulations and guidelines, to consider climate change across different EIA regimes (Gao, 2018; Kamau & Mwaura, 2013; Loza & Fidélis, 2021; Matemilola et al., 2019; Sok, Boruff & Morrison-Saunders, 2011; Woolsey, 2012; Yi & Hacking, 2012), and a wide variation between different sectors within countries, such as housing, energy and transport where such expectations are applied inconsistently (Jiricka-Purrer et al., 2016; Yi & Hacking, 2012). For example, in England, review studies have observed deficiencies in EIA detail on adaptation and mitigation measures to climate change in addition to monitoring of climate-related parameters of transport developments (Hands & Hudson, 2016). Further, energy infrastructure in the USA lags behind other sectors, such as transport and housing, when considering climate change integration in EIA (Ulibarri & Han, 2022). As a result, there is no global or best practice standard and few EIA regimes have established guidelines and regulations for the substantive integration of climate change considerations in EIA (Chang & Wu, 2013; Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016).

The International Association for Impact Assessment (IAIA) Principles of Environmental Impact Assessment Best Practice, established that impact assessment should present evidence from a broad range of relevant fields, including climate change, in an integrated way that is meaningful in informing the requirements of environmental decision-makers (IAIA & IEA, 1999). Although a specialised type of climate change impact assessment exists (Morrison-Saunders et al., 2014), scholars and IAIA best practice principles expect climate change to be more effectively addressed in impact assessment when integrated into existing decision-making tools such as EIA and SEA rather than through separate or new climate change assessment tools (Byer et al., 2012; Morrison-Saunders et al., 2014; Retief et al., 2014). Integration in the context of climate change, potentially requires the full range of relevant climate change considerations to be comprehensively and systematically addressed within the EIA process (Byer et al., 2012; Gao, 2018; He, 2013; Loza & Fidélis, 2021). This contrast the current practice where climate change considerations are rarely considered and where specialist climate-related studies are externalized from the core EIA process with little influence on the core decision-making concerns of EIA (Gao, 2018; He, 2013; Morrison-Saunders et al., 2014; Retief et al., 2014; Retief et al., 2016). Consequently, there is no clear direction on what level of integration is sufficient for environmental decision-making across multiple contexts and EIA regimes for proposed policies, programs, plans and projects.

This research was inspired by recent developments in South Africa, where the researcher is based and where recent case law in EIA review has marked an influential shift in jurisprudence and recognition that it is relevant to consider climate change within the scope of EIA (van der Bank & Karsten, 2020). Subsequent development of a "National Guideline for Consideration of Climate Change Implications in Applications for Environmental Authorizations, Atmospheric Emission Licenses and Waste Management Licenses (the "Guideline"), recognizes the need to integrate impacts of a changing climate, both mitigation and adaptation, at a project level in South Africa (DFFE, 2021b). Yet, South Africa, like many other EIA regimes globally, has not generally considered climate change integration in EIA to date.

This study therefore reviews current progress across a range of 16 EIA regimes globally. It first identifies regulatory regimes and practice guidelines established to promote climate change integration in EIA. Then it identifies the growing normative expectation for climate change considerations to be integrated in EIA and describes the range of ways this is done across a variety of EIA regimes. An analytical framework is developed through extension of existing typologies of integration in EIA (Kørnøv, Lyhne & Davila, 2020), to guide the analysis of EIA regimes. The analysis considers the range of levels of integration across these EIA regimes and highlights the practice gap between expectations and understandings of how to go about it. Synthesizing this nascent progress in EIA practice with normative expectations, the discussion highlights the opportunities, importance, and challenges for climate change integration in EIA at various levels of integration along with key lessons for EIA regimes looking to leverage the tool of EIA for climate action. Furthermore, drawing on observations of the variety of levels of integration, the discussion also reflects on what levels of integration are practicable for minimally sufficient integration of climate change consideration in EIA through to more ambitious levels of integration.

The research concludes with reflection on the potential integration of climate change considerations across multiple EIA regimes. These findings are potentially relevant to countries where climate change considerations are new or under development for the EIA regime. The findings outline how future research and practice can better integrate climate change considerations in EIA, where substantive climate action in decision-making is yet to be realised through the tool of EIA. Finally, the research concludes with commendation of the use of levels of integration developed here to advance research, practice on EIA, and extend our understanding of how substantively climate change is considered in EIA.

1.1 Problem statement

Effective implementation of EIA is expected to lead to projects with fewer negative socio-economic and environmental effects (Agrawala et al., 2012). The main goal of EIA is to assess potential environmental impacts from a proposed activity on the environment. Through identifying potential impacts, EIAs also aim to propose measures to avoid (if possible) or mitigate and minimize (if it cannot be avoided) potentially negative impacts, as one of the requirements before approval of an activity. Failure to consider relevant climate change aspects in EIA, for example atmospheric pollution in the form of GHG emissions from proposed expansion of coal-based thermal power stations and coal mining, would miss the purpose of the tool (Retief et al., 2016; Roy & Schaffartzik, 2021).

Where GHG emitting sectors require new developments, there is an opportunity for EIA to play a significant role in climate action through strengthening environmental governance for climate change. Using EIA processes can guide decision-making to ensure that alternatives are considered to avoid or reduce negative environmental impacts (Bell & Fisher, 2020). EIA can also anticipate and manage proposed activities from the impacts of a changing climate by examining appropriate climate change adaptation measures during the EIA process (Hands & Hudson, 2016; Ulibarri & Han, 2022).

Yet, the potential of integrating impacts of climate change into across EIA regimes, at a project-specific level, remains mostly underexplored and the existing EIA legal regimes fail to include climate change explicitly. Thus, this research intends to identify a range of regulatory regimes and practice guidelines to better understand how integration of climate change considerations in EIA can be achieved.

1.2 Research questions

1. To what extent and how do existing regulations and guidelines require consideration of climate change in EIA?

2. What guidance can be obtained from these EIA regimes to potentially advance integration of climate change considerations in EIA?

Climate change integration in EIA is a new research topic in EIA and an emerging development in the practice (Ulibarri & Han, 2022). Thus, this research aims to identify emerging practices from a range of EIA regimes in order to establish a review of progress to date. This was achieved through the following objectives:

i. To identify a range of regulatory regimes and practice guidelines which explicitly require consideration of climate change in EIA.

ii. To develop a typology and categories of integration for analysis of differing climate change consideration requirements in EIA.

iii. Analysis of regulations, guidelines, and peer-reviewed review articles on integration of climate change considerations across a variety of EIA regimes:

    - To identify how regulations and guidelines require climate change considerations to be integrated in EIA.
    - To evaluate required levels of integration across the sample of EIA regimes.
    - To identify key themes and emphases of integration (e.g., mitigation and adaptation, important sectors, and at which stages in the process).
    - To identify common exclusions and major challenges to integration.

iv. Identification of general lessons that hold the potential to advance the integration of climate change considerations in EIA.

1.3 Methodological approach

The study used qualitative research techniques to review 16 regulatory regimes and practice guidelines for integrating climate change within EIA processes and identify the range of levels of integration across these international EIA regimes (see Methods for more detail). Selected and reviewed regimes include (Austria, Australia (Western Australia (WA), Northern Territory (NT) and the Australian Capital Territory (ACT)), Canada, Caribbean, EU, Grenada, South Africa, South Korea, South Pacific states, Spain, the Netherlands, UK, USA, International Finance Corporation (IFC) and the World Bank (WB). An indicator of levels of integration was developed to structure the analysis. The developed analytical framework considers levels of integration in EIA, how they relate to the content analysis for assessment of the integration of EIA regimes and international best practice and identifies lessons to support the practice in other countries.

The methodology used includes a desk review of literature, guidelines, and regulations. A review of existing English language literature was based on searches in Google Scholar, Primo, Web of Science, ELAW and ECOLEX. The preliminary search terms of TS= (EIA AND "climate change") were used. Also, a secondary search using the same platforms extended the search Topic= (EIA AND "climate change") through including keywords of 'adaptation', 'mitigation', 'greenhouse gas' (GHG), 'carbon', 'climate variability', and 'CO_2'. However, selection criteria and limitations are well elaborated in the Chapter Three of this paper

1.4 Thesis structure

Chapter One provides the background, statement of the problem and the rationale of the study. This is followed by the main research questions, aims and objectives. The main concepts and the limitations of the research are also highlighted. The literature review and relevant theoretical framework that informed this research are covered in Chapter Two. Chapter Three expounds the research methodology employed. Data analytics and corresponding results are introduced in Chapter Four while the main findings are discussed in Chapter Five. In Chapter Six, the conclusion and recommendations from the study are deliberated.

2 LITERATURE REVIEW

This chapter introduces two main themes of this research, climate change and EIA. It covers current understandings of both, their relationship, and their potential for integration in *ex-ante* environmental decision-making of the overview of climate change. It describes relevant international environmental governance instruments concerning climate change and highlighting the part that EIA can play as a decision-making tool for climate governance. It identifies how these instruments have been interpreted to afford climate change integration in EIA. It then provides an overview of EIA process, purpose, modes of integration, and its potential to integrate climate change considerations. The concept of integration, relevant to the analytical framework, is also introduced in preparation for the Methods section and presentation of the analytical framework in Chapter Three of determining the levels of climate change integration within EIA.

2.1 Climate change

Governance of proposed developments is facing challenges due to inadequate *ex-ante* decision-making safeguards for environmental protection. One dimension of this is lack of controls on proposed activities which contribute towards human caused climate change together with detrimental effects of broader impacts such as loss of habitat, and environmental pollution (Lenton et al., 2019).

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a "change of climate which is attributed, directly or indirectly to human activity which alters the composition of the global atmosphere" (UNFCCC, 1992). Through negative feedbacks, natural and human systems are exposed to the negative climate change-related impacts especially those most vulnerable (IPCC, 2018). Without rapid and deep cuts to GHG emissions, the current emissions pathway is projected to cause a continued rise of global mean temperatures to about 4.1°C– 4.8°C above the pre-industrial level by the end of this century, way beyond the 'safe' limits set at 1.5 degrees of warming (IPCC, 2018). According to the IPCC (2018), in its analysis of the 1.5°C warming, restricting temperature rise to 1.5°C warming would require a massive and speedy transformation in all major sectors. Human-induced CO_2 emissions alone, would need to be cut by approximately 45 per cent from 2010 levels by 2030 and achieving a 'net zero' by 2050. To ensure global warming is not exceeding 1.5°C relative to 2.0°C, more effort is needed, including promoting a more sustainable and just society (IPCC, 2018).

Human activities are the potential source of the increased global average temperature through increased GHG emissions. This has been recognised and calculated for a long time and it has been agreed that humans are causing global warming. The IPCC (2013) indicates and shows evidence on changes and human influence on the climate system from the increasing GHG concentrations in the atmosphere. These changes have deteriorated the capacity of the environment to support ecosystem biodiversity and ecological resilience. For instance, most electricity is still generated from fossil fuels such as coal. These activities lead to cumulative effects and their warming influence is predicted to stay into the following century (IPCC, 2013). It is certain that humans are responsible for recent global climate change, thus, effective solutions are required to be implemented.

Some of the impacts that are anticipated include warming and acidification of the oceans, snow cover will decrease, sea ice will diminish, the number of displaced people will increase, and the world will experience increasing record-breaking temperatures, frequent heavy precipitations, and forest fires (IPCC, 2018). According to IPCC (2014), average sea-level rise is anticipated to hit 24–30 cm and 40–63 cm by 2065 and 2100, respectively, in relative to the reference period of 1986–2005. Many climate changes are projected to continue for hundreds of years, even if GHG emissions are stopped immediately. There is an alarming indication that significant tipping points, leading to irreversible shifts in the global climate system and its ecosystems, may already have been reached or surpassed (Lenton et al., 2019). This indicates the need to improve climate change considerations in environmental governance tools like EIA.

2.2 International instruments and climate change policy framework

Through a commitment to the UNFCCC's advice on mainstreaming climate change, most countries around the world, are now putting formal climate governance policies in place. This section briefly explains international environmental governance instruments concerning climate change.

2.2.1 International environmental governance instruments concerning climate change

International law can be defined as the body of rules and principles which is binding upon nations, and that rules their relationship with one another (Owen, 2008). In this sense, they can have considerable influence on the environmental governance policies and practices and their peculiar domestic emphases. Since the early 1990s, governments from around the world joined together for discussion to address the global environmental challenge of climate change. These debates have raised worldwide awareness about climate change, intensified more studies on its causes, and different mechanisms were developed that encourage states to reduce the increased emissions of GHG (Agrawala et al., 2012). However, while international measures to promote climate change adaptation and mitigation measures have been discussed, their implementation falls short of recommendations set by the IPCC 1.5 Special Report (IPCC, 2018). Some key international agreements and institutions which are directly EIA and climate change -related are described in a section below.

The UNFCCC was established and adopted to address climate change by the United Nations (UN) in 1992 at the Rio Earth Summit. It is a framework treaty for intergovernmental efforts and since its establishment, a total of 189 nations have signed the convention.

The UNFCCC regulates and supports the global effort in reducing emissions of GHG and the effects of climate change which, by the time the treaty was established, were inevitable (Sicango, 2020; WA EPA, 2020). The main UNFCCC goal is achieving stabilization of GHG concentration in the atmosphere at a level that would minimize and prevent human-induced interference with the climate system. Accordingly, Article 4(f) stipulates that: "All Contracting Parties have responsibilities to consider climate change, to minimize adverse impacts on the economy, public health, and quality of the environment, in projects or measures undertaken to mitigate or adapt to climate change" (UNFCCC, 1992). Also, it requires formulation, implementation, publication, and frequently updating national and, where applicable, regional plans comprising measures to adapt and mitigate climate impacts (UNFCCC, 2003). One such measure includes mainstreaming climate change into environmental management through, for example, guidelines and regulations that integrate climate change into EIA.

The Paris Agreement was established in 2015 to ensure effective implementation of the objectives put by the UNFCCC. The objective of the agreement is to hold the increase in global average temperature to "well below 2°C above preindustrial levels," and holding it within 'safe' limits set at 1.5 degrees of warming. It also highlights the main obligation of each party: to ensure successive implementation of nationally determined contributions (NDCs) by pursuing and establishing domestic measures for climate change mitigation and adaptation. These contributions contain climate action plans for each party and are to be provided every after 5 years, recorded, and maintained by the UNFCCC Secretariat.

Moreover, the Paris Agreement requires nations to develop new plans, policies, other instruments, and mechanisms aimed at limiting the contribution of human-induced climate change while existing ones must be evaluated for effectiveness. EIA is a particularly common regulatory tool for *ex-ante* environmental decision-making (Matemilola et al., 2019). Hence, integrating climate change considerations in EIA can potentially contribute to the policy and practice goals of NDC mitigation and adaptation targets.

2.3 Environmental impact assessment (EIA)

2.3.1 EIA purpose

The WB defines EIA as "an instrument to identify and assess the potential environmental impacts of a proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures" (World Bank, 1999). EIA identifies, predicts, and assesses the potential impacts on the environment imposed by a project. EIA is usually conducted prior to project commencement to assist the decision-making process with necessary details concerning probable effects of the proposed development. Also, to promote environmentally friendly decisions which contribute towards sustainable development by assessing appropriate improvement and mitigation measures for the project (World Bank, 1999). The USA was the first to commence with EIA practices during the early 1970s, governed by the National Environmental Policy Act (NEPA) of 1969 (Abdul-Sattar, 2007). The tool was developed after the growing realization of the negative human-caused impacts on the environment and society especially from land-use activities (Glasson & Therivel, 2019).

According to the IAIA, EIA has four key objectives, which are:

i. To ensure that environmental considerations are explicitly addressed and incorporated into the EIA and other development decision-making process.

ii. To predict and avoid, minimize, or offset the adverse significant biophysical, social, and other relevant effects of development proposals.
iii. To protect the capacity and productivity of natural systems and the ecological processes to maintain their functions, and
iv. To promote sustainable development that optimizes resource use and management opportunities (IAIA & IEA, 1999)

The administration of the EIA process varies from jurisdiction to jurisdiction, the great majority now meet the above-mentioned objectives. Only a few, however, incorporate climate change consideration as an environmental issue to be taken into account either as a criterion in the assessment of the proposed project impact on the environment or the effect of a changing environment on the proposed project (FPTCCCEA, 2003).

An effective and applicable EIA system is required in order EIA to contribute towards sustainability, the tool's substantive purpose. An EIA process requires the coordination and cooperation of actors and a regulatory framework to accomplish EIA goals (Kolhoff, Runhaar & Driessen, 2009). A regulatory framework is fundamental in the EIA process since it provides guidance on how EIA should be performed, the steps, activities, practices and developing institutional arrangements. The regulatory framework guides the way the EIA is meant to work, guiding, assessing impacts and alternatives that should be analysed and establishes type and scope of activities requiring environmental authorisation. The framework informs how relevant licenses and permits should be approved (Kolhoff, Runhaar & Driessen, 2009). Therefore, an appropriate EIA regulatory regime is the key first step in supporting environmental management, enabling sustainable development to be promoted, but critically also determines the scope of climate change considerations required for environmental authorisation.

2.3.2 EIA processes

Although EIAs are carried out in many countries around the world, their performance varies from region to region. In general, however, EIA follows a set of established procedural steps from initial screening and then scoping through impact assessment and evaluation to the environmental authorisation and follow up, monitoring and management plans (see Table 1).

Table 1: Overview of the EIA process globally (International Institute for Sustainable Development (IISD, 2016).

Phase	Description
Screening	• Identifying proposed projects or activities requiring a comprehensive EIA due to its potential environmental and social impacts.
Scoping	• Key environmental issues and impacts that trigger detailed assessment are identified, including creating EIA boundaries, project alternatives, stakeholder consultation, and developing the EIA Terms of Reference (ToR).
Impact Assessment, evaluation & Mitigation	• Involves a detailed evaluation of the planned project's potential environmental and socio-economic impacts along with possible alternatives against the baseline environment and thereafter identify appropriate measures to mitigate and avoid or reduce impacts.
The EIA Report	• Comprises of detailed/ comprehensive analysed information gathered during the EIA process per the TOR.
Review	• This confirms the value of the information and processes employed. It also verifies that the EIA report contains/captured all the relevant mitigation measures to address all pertinent and cumulative impacts.
Environmental decision-making phase & Licensing	• The final decision of the EIA review could be "approved", and the proponent will be served with a provisional environmental permit together with terms and conditions of approval or could be "not approved".
Environmental management Plan (EMP)	• An EMP creates a series of protocols and arrangements intending to manage and monitor the identified mitigation measures as well as potential risks that may occur over the project life cycle.
Monitoring	• Important in verifying the implementation of all commitments made in the authorized EIA. This is an ongoing procedure for a given project beyond project implementation.

2.4 Role of EIAs in climate change

The IAIA has recognised the polluting contribution of human activities on the climate, and that changing climate affects natural systems and humans and causes a severe challenge to ecosystem sustainability and economic development (IAIA, 2013), and recognise the:

> Potential beneficial and adverse effects due to climatic change should therefore be explicitly considered in decision-making about proposed policies, plans, programs, and projects. Impact Assessment (IA) can ensure that the design of policies, plans, programs, and projects properly addresses both the mitigation of climate change (the effects of the proposal on greenhouse gas emissions), and adaptation to climate change (effects of climate change on the proposal). Considering climate change in decision-making through IA can help reduce vulnerability to a changing climate and thus increase the resilience of natural and human systems (IAIA, 2013).

Importantly, the IAIA also emphasizes that climate change must be integrated together with social, economic, and environmental issues posing threats to natural systems and human. An integrated balanced instrument that considers both climate and non-climate risks is needed (IAIA, 2013).

Most EIA projects indirectly or directly relate to climate change, as proposed developments may both cause or be affected by it (Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016). Hence, an EIA is a potential tool for addressing GHG emissions and measures to mitigate and adapt climate change (Haroff & Moore, 2007; Kok & De Coninck, 2007; Owen, 2008).

Unlike most climate governance institutions, EIA does not need the formulation of an international agreement to make it happen (Agrawala et al., 2012). But it needs enabling regulations for climate change to be within the scope of considerations. It allows practitioners to produce solutions tailored specific to their situations. Furthermore, it has been argued that climate change integration in EIA is an emerging legal obligation for many states (customary international law) (Mayer, 2019b). Hence, an emphasis on EIA has enormous potential to bridge a gap between local actions and global ambitions to achieve global solutions by modifying current national and international norms on the global environmental problem of climate change. This linkage has been influencing decisions of local urban planners to connect available decision tools such as EIA, localized laws, and global climate change policy.

Moreover, as a legal instrument, EIA has tangible benefits for addressing the climate change effects. While most approaches are limited to either adaptation or mitigation, EIA can combine both components in one decision-making process, by first assessing both impacts on and of climate change. Also, it might promote litigation if the EIA decisions fail to assess and account for climate change factors so that proponents become responsible to implement appropriate actions to reduce the likelihood of climate litigation. In respect of adaptation, identification and evaluation of changes in baseline environment and long-term environmental risks caused by a changing climate could improve resilience and reduce maladaptation risk by the provision of appropriate adaptive measures (He, 2021). These measures may improve the project's resilience to climate variability and natural hazards, thus, saving money in the occasion of extreme events caused by a changing climate.

Furthermore, stakeholder engagement as a critical component of the EIA, also provides a participatory approach through which all stakeholders can become aware of climate change risks and the need to adopt more resilient measures (Wentz, 2015). Through its participation structures, EIA can also enable local actors to implement international climate-change commitments through domestic involvement and decision-making and ensure that development and population growth do not entirely oppose current and forthcoming initiatives made to address climate change.

Also, most legal systems mandate government action on what to do in responding to climate change but do not impose many obligations on the private sector (except GHG emission reduction obligations). Hence, an EIA is one way of leveraging a response to climate change from the private sector (Füssel & Klein, 2006).

EIA assesses the environmental impacts of a proposed activity and less frequently considers the effect of a changing climate on the activity itself. Yet, the effects of climate change will potentially have consequences for future environmental quality affecting proposed plans or projects. This may happen for developments such as bridges, drainage systems and hazardous/harmful waste or material storage facilities, where a lack of consideration of climate impacts, during project design, may result in unexpected downstream and environmental feedbacks, as well as risks to the stability or even survival of the project infrastructure itself (Pyke & Batten, 2008).

However, to be potentially more effective and efficient, an existing EIA framework must be broadened to include climate change considerations. At the outset, the crucial issue for integration in EIA is to decide how and when climate change considerations become initiated in the process of EIA.

2.5 Integration in EIA

At face value integration entails a "combination of two or more things or concepts to become more effective and into one" (Getty & Morrison-Saunders, 2020). However, for assessment purposes, substantive transformations to a diversity of information are needed to assess, evaluate, and synthesise the information for informed decision-making (Eggenberger & Partidário, 2000; Kørnøv, Lyhne & Davila, 2020). Integration in EIA is anticipated to enhance efficiency, reducing duplication, and to improve environmental outcomes by allowing a more integrative project assessment (Getty & Morrison-Saunders, 2020). While many scholars support the idea of integration (Getty & Morrison-Saunders, 2020; Sánchez, 2014) others, such as Greig and Duinker (2014) are less convinced. In their view, integration may be achieved simply through better scoping.

The term 'integration' has various meanings and is perceived differently between people. Approaches for implementing integration remain challenging as the vague notion of sustainability is intended as the focus for integration (Morrison-Saunders et al., 2014), and only recently have scholars articulated how integration can be operationalised (Kørnøv, Lyhne & Davila, 2020).

Guided by the IAIA guiding principle of 'integratedness' (IAIA & IEA, 1999), this research is guided by how Kørnøv, Lyhne and Davila (2020) who operationalised integration in their study through the development of levels of substantive integration of the Sustainable Development Goals (SDGs) in EIA (see Methods chapter and Figure 1).

2.5.1 Climate change integration using EIA-related regulations and guidelines in each phase of the EIA process

Regulations and guidelines play a vital part in addressing climate change in EIA. A survey involving different countries was conducted by Sok, Boruff and Morrison-Saunders (2011) to study how the considerations of climate change can be integrated in all stages of EIA. Furthermore, IAIA members suggested that instead of waiting for regulatory guidance which might take years to enforce, the IA professionals can develop best practice (Sok, Boruff & Morrison-Saunders, 2011).

Given the complications for integration implementation, only a few countries have demonstrated their readiness in this direction and have gathered considerable experience to bridge the intention-action gap (Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016; Gao, 2018; Jiricka-Pürrer et al., 2019; Jiricka-Pürrer, Alexandra, Wachter & Driscoll, 2019; Matemilola et al., 2019). However, a growing number of jurisdictions have formalized and extended their EIA regimes to integrate climate change considerations through the revision and interpretation of current traditional EIA regulations and the development of guidelines. For example, the EU has EU (2014) Directives that support integration of climate change, EU has also produced the Guidance on Integrating Climate Change and Biodiversity into EIA. It requires details of the project's impacts on the climate including the magnitude and nature of GHG emissions and how susceptible the project is to climate change (EU, 2014; European Commission, 2013). The Canadian Environmental Assessment Agency (CEAA) places requirements and adopted practice guideline to assess climate change directly in the EIA guidelines for each project they are to assess and has provided general guidance for practitioners (FPTCCCEA, 2003). The US Council on Environmental Quality (CEQ) under NEPA has guidance on considering climate change factors (CEQ, 2016). In addition to governmental guidance, several international organizations have also supported these legislative developments. For example, the IFC has issued their performance standards that emphasises social and environmental sustainability, World Bank (WB) also has its standards (Agrawala et al., 2012). Also, the theme of the 2017 IAIA conference was part of the global efforts contribution of EIA in addressing climate change (IAIA17, 2017). Hence, it is evident that climate change could be addressed by reinterpreting or revising the current EIA framework as seen from these developments. Many countries are adjusting towards this direction by reflecting national practice, thus, it has now become a global trend (He, 2021).

However, there are countries including China which have not shown the intentions yet of considering climate change integration in their regulations or having a guideline for that matter. For instance, Climate change is not considered at all in the environmental regulations in China. According to Chang and Wu (2013), the integration of climate change in China faces challenges because of inadequate legislation, standards, and experience of doing it. Gao (2018) confirms the situation as well that institutional barriers, malfunction of EIA procedures and challenges in technologies and resources to accommodate climate change parameters and uncertainties have been hindering the integration of climate change in EIA. Although there are climate change-related regulations (not climate change-EIA regulations), most of them have little binding effect and they are not given much priority.

Climate change is identified as a global environmental challenge, nevertheless, in China neither the recent revised Environmental Protection Law (EPL) nor the new developed EIA Law explains that climate change can be considered as an environmental problem that should be integrated in the EIA process (*Environmental Impact Assessment Law, 2002; Environmental Protection Law, 1989*). For example, unlike the EU Directive, the EPL does not extend and give details of the definition of ‘environment’ to cover climate change. Thus, vulnerable projects or projects that emit GHG are not directly subject to EIA obligations. However, China is facing a dilemma of how to bridge between domestic decisions and distant global aspirations due to the increased pressure from climate change and growing momentum on climate change mainstreaming (Gao, 2018). Although climate change can be regulated at a project level, notable challenges for doing so cause serious doubts regarding its implementation and according to He (2021), it is more likely for now China will continue to address climate change in a separate way rather integrating it in EIAs. Yet, this does not mean that China’s legal EIA regime offers no environment for climate change integration (He, 2021).

On the other hand, despite having no formal guidance, regimes including Kenya are aspiring to bridge the intention-action gap and it has been seen in their practices. For instance, Kamau and Mwaura (2013) and Nyarieko et al. (2019) identified that inadequate EIA regulations were found to be the main barriers to climate change integration in EIA. Another barrier identified was a weak institutional monitoring and enforcement capacity. Kenya has stepped up over the last decade in climate change related plans, strategies, and legislation, also made effort to create an environment to allow integration of the climate change considerations into EIA through the establishment of various policy and legal instruments including the *Climate Change Act No.11 of 2016* which explicitly requires climate impact assessment be integrated into EIA. However, it is not reflected in EIA legal requirements, *Environmental Management and Co-ordination Act, 1999 No 8 of 1999* and related regulations. The intention is there, nevertheless, the level of integration is low and limited to recommendations for adaptation mostly in the reviewed EIA in the transport sector. The Nyarieko et al. (2019) study shows that 98.5 percent of the 68 road EIA reports recorded climate baseline, and none recorded future climatic conditions such as rainfall projections and temperature and no risk assessment. The findings indicate that existing Kenyan EIA regime has low contribution or no contribution at all in addressing climate change. This is similar to Kamau and Mwaura (2013) findings.

To illustrate the role of EIA-related regulations and guidelines in climate change integration, the following table shows suggestions of key approaches to each EIA stage by Sok, Boruff and Morrison-Saunders (2011), that can be incorporated in EIA-climate change-related regulation and guidelines.

Table 2: Key approaches for addressing climate change using regulations and guidelines specific to each phase of the EIA system (Sok, Boruff & Morrison-Saunders, 2011).

EIA Phase	Regulations/Guidelines
Screening	• Regulations describing screening lists to address climate change considerations (whether environment-focus or development-focused, or a combination of both approaches)
Scoping	• Regulations requiring that climate change considerations be integrated in all aspects of assessed projects • Guidelines classifying climate change considerations which should be integrated at this stage
Impact Assessment Statement (EIS)	• Guidelines identifying specific climate change considerations, prediction and evaluation methods and climate change mitigation and adaptation measures, including Management and monitoring plans
	• Guidelines classifying and directing local and expert stakeholders' involvement • Guidelines identifying climate change considerations which should be considered and discussed with stakeholders • Regulations mandating independent climate change experts to peer-review the content of EIA prior to its approval • Regulations requiring independent third parties to monitor and follow-up commitments made in the approved EIA
Evaluation and Approval	• Regulations specifying approval criteria and conditions • Guidelines for evaluation and approval to benefit all stakeholders
Implementation and Monitoring	• Regulations for auditing and monitoring the compliance of climate change adaptation and mitigation measures • Regulations for enforcement of climate change mitigation and adaptation measures • Guidelines that will improve monitoring and enforcement of climate change mitigation and adaptation measures

Nevertheless, despite legal requirements to include climate change impacts into environmental assessments; additional guidance is necessary on how to integrate these assessments systematically and consistently in the regulations and guidelines for a smooth EIA process. According to Sok, Boruff and Morrison-Saunders (2011), regulations are needed to address climate change as they can initially trigger and provide a clear basis for enforcement which can also be facilitated by establishment of guidelines for the scoping, EIS and public participation phases. Importantly, the screening phase requires higher-level regulations and guidelines (outside the traditional EIA) to enact and direct how climate change is addressed.

3 MATERIALS AND METHODS

This section presents the methods used in this research to explore and assess the variety of integration of climate change considerations across a range of EIA regimes. It gives an overview of the research method and design, including the analytical framework and selection criteria of EIA regimes. It then explains and justifies the data collection process. Finally, it presents the evaluation criteria developed for assessment of integration of climate change considerations in EIA together with its scoring criteria.

3.1 Research approach and design

As the study is exploratory in nature, a qualitative research design was adopted to gain an in-depth and holistic understanding of practice, concepts, cases, and content. Conducted within the constraints of COVID-19 lockdowns in South Africa in 2020-2021, the study employed desk-based research techniques to identify literature and a variety of EIA regimes for content analysis. Selection and concentration on content themes of EIA guidelines and regulations was informed by exploratory reading of the literature which identified both regulations and guidelines to be the key factors affecting integration of climate change considerations in EIA (Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016; Sok, Boruff & Morrison-Saunders, 2011). Therefore, the study employed qualitative research techniques in reviewing a range of 16 regulatory regimes and international guidelines for integrating climate change within EIA decision-making processes.

An analytical framework of levels of integration was developed for assessing levels of integration of climate change considerations in EIA; how they relate to the content analysis for assessment of the integration of EIA regimes to identify lessons for extension of the practice.

3.1.1 Analytical framework

This study defines integration as a synthetic combination of data and concepts from a range of disciplines, including the diversity of specialist studies involved in an EIA, to inform a decision concerning a proposed activity more effectively (Getty & Morrison-Saunders, 2020; Kørnøv, Lyhne & Davila, 2020) as seen in (section 2.5).

An analytical framework to capture the range of levels of integration was developed to structure the analysis. The framework draws on the idea of integration recently developed and applied to EIA considering the integration of dimensions of sustainability encoded in the Sustainable Development Goals, and adapted here for requirements for substantive consideration of climate change in EIA (Kørnøv, Lyhne & Davila, 2020) (Figure 1). The framework proposes three categories of integration ('radical integration'; 'partial integration'; 'non-integration'), each with a sub-set of two indicators to provide six levels of integration as described in Figure 1 below.

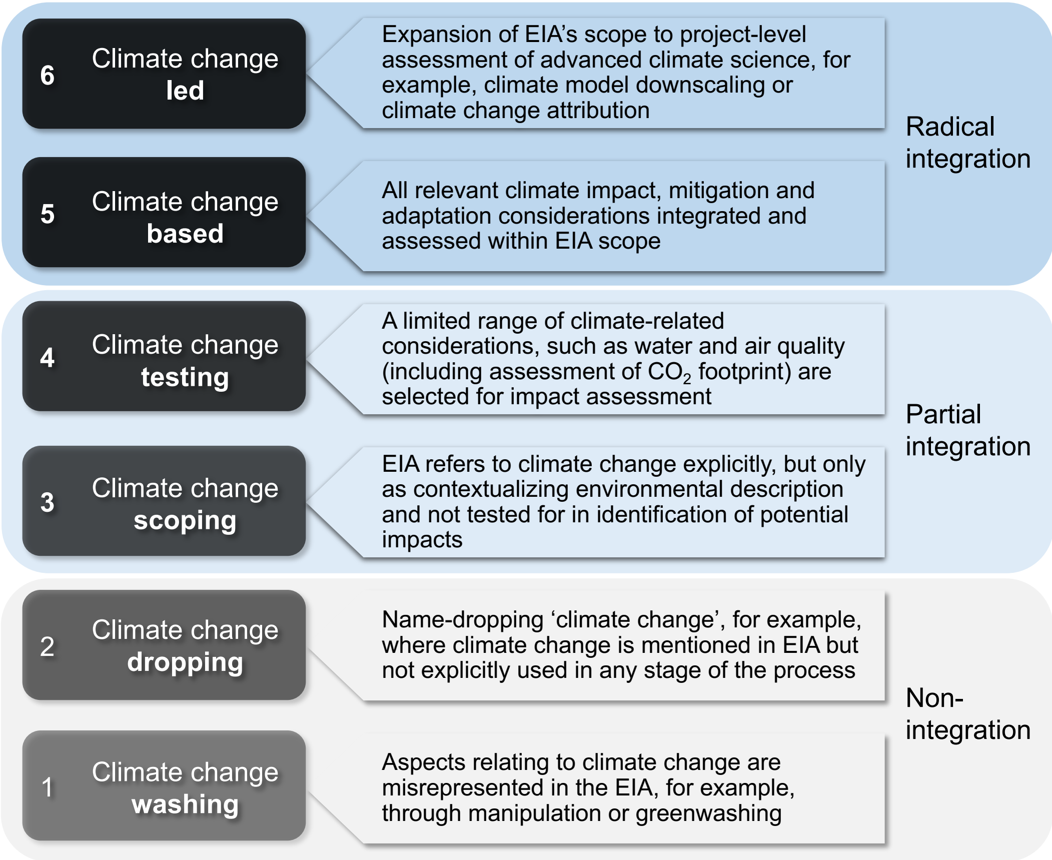

Figure 1: Analytical framework for levels of integration adapted from Kørnøv, Lyhne and Davila (2020).

Figure 1 above shows the adapted analytical framework for considering levels of integration of climate change considerations in EIA. This framework is proposed to capture the current challenges to integration, variety of integration, as well as non-integration of climate change considerations in EIA. The levels scope where EIA practice may extend towards 'climate testing' or 'radical integration' depending on the relevance of climate change to potential impacts and regulatory appetite for implementing climate action through EIA.

The categorized levels within 'radical integration', the highest level of integration conceptualised, are 'climate change led' (Level 6) and 'climate change based' (Level 5). These two levels generally require broadening EIA requirements through regulatory and guideline developments to mainstream consideration of climate change in environmental decision-making. It involves a high level of integration that is framed by and includes all climate change parameters relevant to the proposed activity. Climate change inclusion in this category helps define the key issues and can add to science through deepening project level understandings of different measures to mitigate and adapt climate change.

The categorised levels within 'partial integration'. The mid range of integration are articulated as 'climate change testing' (Level 4) and 'climate change scoping' (Level 3). These levels of integration aim to capture the best practice status quo prior to climate change mainstreaming in EIA. Generally, climate change parameters recieve limited consideration and the assessment does not include all key climate change mitigation and adaptation issues potentially relevant to the proposed activity. The upper range of 'partial integration' does aim to capture EIA requirements for a level of integration of 'climate change testing' where, studies include explicit climate change consideration of a limited range of parameters, such as carbon footprinting. However, 'climate change scoping' aims to capture a practice requirement where the findings of narrowly selected climate change parameters are subordinated to other environmental dimensions, and/or economic or political impertives and have limited influence on the final environmental decision. In such a case, testing of climate change parameters are a performativity of environmental assessment where for example, there are multiple procedural actions without substantive outcomes and with little substantive influence on decision-making.

Two levels of 'non-integration' are conceptualised. They include (Level 2) 'climate change-dropping' and (Level 1) 'climate change washing'. The two levels of non-integration demonstrate more than lack of intention to substantively integrate climate change aspects in the EIA process. 'Climate change-dropping' illustrates a situation where climate change is mentioned (for example, in background description of the environment), but not explicitly used in the EIA assessment process. 'Climate change washing' captures a more manipulative dimension, like 'greenwashing', where the term climate change is used to deliberatly mislead or deceive for justification of a proposed activity but which is in contradiction of climate action or broader sustainability goals.

3.1.2 Data collection and EIA regime selection criteria

A review of existing English language EIA literature, regulations and guidelines was based on searches in Google Scholar, Primo, Web of Science, ELAW (Environmental Law Alliance Worldwide), ECOLEX (the gateway to environmental law) and Website specific to a certain regime using preliminary search terms of TS= (EIA AND "climate change"). The regimes selected for analysis were informed by those highlighted in the literature, including both review and case studies, as those likely to have documented requirements, particularly if expressed in guidelines or regulations or/and have shown intentions, for climate change integration in a regime's EIA practice. A secondary search using the same platforms extended the search TS= (EIA AND "climate change") through including keywords of 'adaptation,' 'mitigation,' 'greenhouse gas' (GHG), 'carbon,' 'climate variability,' and 'CO_2.' For each occurrence it was assessed whether and how it deals with GHG emissions, mitigation, adaptation, baseline adaptation and how is it being considered in each step of EIA. To entail practice requirements for consideration of climate change in EIA, this review identified 22 EIA regimes described in the peer reviewed literature. On further exploration, six of these regimes (China, Kenya, Germany, Zimbabwe, Ghana, and Nigeria) did not have regulations, guidelines nor documented intention to integrate climate change consideration in EIA and they were therefore excluded from the study on grounds they could not satisfy the empirical demands of the analysis.

Table 3: Data collection methodology, sources used and limitations

Data collection methodology	Data sources used	Limitations of the study
Desktop review	• Google Scholar, Primo and Web of Science, ELAW, ECOLEX and website specific to a certain regime were used to access the following: Literature reviews (books, journals, newspapers, internet, Regulations and Guidelines and other library materials). Refer to the list of references	• There was a wide variety of contemporary research on some regimes regarding climate change integration in EIA i.e., Canada but limited material in some regimes i.e., Austria and Grenada • The Basic Assessment Process was excluded from the research scope with the intention to focus on projects requiring a full EIA process. • Only English language guidelines, laws or regulations were reviewed. • This research did not review existing EIA reports because of significant difficulties in accessing EIA reports. • Although integration of climate change considerations in Strategic Environmental Assessment (SEA) has seen increasing research and practice attention, EIA remains more understudied than SEA and there remains lack of clarity about integration in EIA. Therefore, SEA was not part of this study.

Review of the literature identified 16 EIA regimes for analysis including, Austria, Australia (Western Australia (WA), Northern Territory (NT) and the Australian Capital Territory (ACT)), Canada, Caribbean, EU, Grenada, South Africa, South Korea, South Pacific states, Spain, the Netherlands, UK, and the USA. Although all EU member states are obliged under Directive 2014/52/EU3 regulation to consider climate change in EIA, each EU member state included in this study was reviewed separately as many have developed their own laws or guidelines which extend or interpret EU obligations. In addition, multilateral organizations such as the IFC and the WB were identified. The purposive approach to regime selection and snowball technique drawing on regimes identified within the literature, it is quite different from relying only on a systematic review process through Web of Science which might have failed to identify the breadth of variety of EIA regimes for the research. The selected 16 reviewed regimes were based on the following criteria.

Table 4: Criteria used to select EIA regimes

No	Criterion requirement	Comments
1	Their EIA regime must have • Regulations that explicitly require climate change integration in EIA, or/and • Guidelines to assist practitioners and/or • Shown or documented intentions for integration of climate change considerations in EIA	• Regulations, guidelines, and existing studies relating to a specific EIA regime were reviewed and assessed for the integration level (Appendix 1 in section 7.1). Literature review of studies relating to the reviewed regimes were also used to inform and as reference during assessment. Literature reviews of studies relating to the reviewed regimes were also used to inform and as reference during assessment. • Other regimes do not have a separate set of Regulation rather they have procedures laid out in the Act that intend to assist in the implementation of the specific law i.e., Spain & Austria
2	• Regulations and guidelines must be in English language	• Only English language documents were reviewed

3.2 Evaluation and scoring criteria for integration

The empirical focus of this research is on climate change considerations in EIA encoded in guidelines and regulations. An analytical framework to capture a variety of levels of substantive integration of climate change considerations in EIA has been developed for assessment. To help with a review and uniform evaluation of the selected regimes, the following scoring system was adopted to determine the extent of the integration of climate change in the reviewed EIA regimes' regulations and guidelines. This involves the scoring levels (four levels of integration and two levels of non-integration) as seen in Figure 1 against each EIA regime's regulations and guidelines. This was achieved by assessing climate change integration in reviewed regulations and guidelines in each stage of EIA while considering relevant parameters and emphases of climate change required to be assessed in the EIA process.

The evaluation criteria used are justified in part by existing scholarship. For example, Agrawala et al. (2012) have suggested several possible entry points in the EIA process where climate change impacts and adaptation could be integrated, namely: screening, scoping, impact assessment phase, baseline assessment, EIA review, environmental management plan and monitoring. These stages were therefore explicitly considered in the analysis. In addition to that, Sok, Boruff and Morrison-Saunders (2011) acknowledged that regulations and guidelines are the key factors for integration. Hence, there is a need for climate change-related guidelines and regulations specific to each phase of the EIA process.

Table 5: Evaluation criteria

Scoring level	Regulations/Guidelines	
Evidence of requirements for substantive consideration of climate change	Evidence of requirements to consider the following climate change components?	Evidence of requirements for climate change consideration in any stage of the EIA Process?
Radical Integration • Climate change led (6) • Climate change based (5) Partial Integration • Climate change testing (4) • Climate change scoping (3) Non-integration • Climate change dropping (2) • Climate change washing (1)	• Mitigation • Adaptation	Screening Scoping Environmental Baseline Impact assessment EIA Review Environmental Management Plan (EMP) Monitoring Plan

3.3 Conclusion

An analytical framework setting out levels of integration was developed to assess how meaningfully climate change considerations are required to be addressed EIAs. The framework draws on the idea of integration recently developed and applied to EIAs considering the integration of dimensions of sustainability in EIA processes, and adapted here for requirements relating climate change considerations (Kørnøv, Lyhne & Davila, 2020). The framework proposes three categories of integration (‘radical’; ‘partial’; and ‘non-integration’), each with a sub-set of two indicators to provide six levels of integration for evaluation. This framework is proposed to capture the range of integration requirements in regulations and guidelines. It also assesses current challenges to integration and non-integration of climate change considerations in EIAs.

4 RESULTS

Internationally, there is a growing expectation for EIA to play a role in climate action in a combination with other environmental instruments such as SEA (Byer et al., 2012). Further, the IAIA has provided guidance on best practice principles for integration of climate change in EIA emphasising impact, GHG mitigation, climate change adaptation, vulnerability, and equity concerns through the need to identify whether and how:

i) The project will increase or decrease GHG emissions, directly or indirectly.
ii) The project may lead to positive or negative climate change impacts or adversely affected by it, either directly or indirectly
iii) Climate change may negatively impact environment that are potentially affected by the project
iv) The project could be used to identify measures to mitigate and/or adapt to climate change (Byer et al., 2012).

Moreover, regulations and guidelines are the key factors for integration (Sok, Boruff & Morrison-Saunders, 2011). Thus, there is need for specific climate change-related regulations and guidelines in each phase of the EIA process. Yet, it is recognized that climate change mainstreaming into the EIA processes needs further research and practice maturity to bridge the intention-action gap (Chang & Wu, 2013; Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016; Gao, 2018; Matemilola et al., 2019).

The overarching aim of this research is to explore a range of regulatory regimes and international best practice guidelines established to promote the integration of climate change in EIA. It also describes the range of levels of integration across these EIA regimes and highlights the practice gap between expectations and understandings in implementation. Here the key findings are presented including analysis of levels of integration across the selected EIA regimes. Also, Table 6 illustrates the range of EIA regimes, regulations, and guidelines with a range of levels of expected climate change considerations within EIA as described in Figure 1.

Table 6: Integration of climate change in EIA as explicit requirement in regulations and guidelines in 16 EIA regimes

No.	EIA Regime	Regulations & Guidelines explicitly require consideration of climate change at specific stages in EIA											Assessed Integration Level based on explicit regulatory or guideline requirement
		Regulation (R)	**Practice Guidelines (G)**	Mitigation Focus	Adaptation Focus	Screening Phase	Scoping Phase	Climate Change Baseline	Impact assessment Phase	EIA Review	Environmental Management Plan	Monitoring	
1	Canada	-	Yes	Yes (G)	Yes (G)	-	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change based -5
2	EU	Yes	Yes	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Climate change based -5
3	UK	Yes	Yes	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Yes (R&G)	Climate change based -5
4	USA	-	Yes	Yes (G)	Yes (G)	-	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	-	Climate change based -5
5	The Caribbean	Country Specific	Yes	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change based -5
6	South Pacific Islands	Country Specific	Yes	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change based -5
7	Western Australia	-	Yes	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change based -5
8	Northern Territory, Australia	-	Yes	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change based -5
9	Australian Capital Territory (ACT)	-	Yes	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change based -5
10	South Korea	-	Yes	Yes(G)	Yes(G)	-	Yes (G)	-	Yes (G)	Yes (G)	Yes (G)	Yes(G)	Climate change testing - 4
11	The Netherlands	-	Yes	Yes (G)	Yes (G)	-	-	Yes (G)	Yes (G)	-	-	-	Climate change testing 4
12	WB & IFC	N/A	Yes	Yes (G)	-	-	Yes (G)	-	Yes (G)	Yes (G)	Yes (G)	Yes (G)	Climate change scoping 3
13	Spain	Yes	-	Yes (R)	-	-	Yes(R)	-	Yes(R)	-	-	-	Climate change scoping 3
14	Austria	Yes	-	-	-	-	-	Yes (R)	-	-	-	-	Climate change dropping 2
15	Grenada	-	-*	-	-	-	-	-	-	-	-	-	Climate change dropping 2
16	South Africa	-	-*	-	-	-	-	-	-	-	-	-	Climate change dropping 2

R= Regulation, G= Guideline

*** Documented Intention i.e.,** the South African "National Guideline for Consideration of Climate Change Implications in Applications for Environmental Authorizations, Atmospheric Emission Licenses and Waste Management Licenses" is currently under development and out for comment. Although there is an influential provincial guideline for the Western Cape, there is currently no nationally mandated guideline.

4.1 Overview of Climate Change Integration in the 16 Reviewed EIA Regime Regulations and Guidelines

Analysis of EIA regimes used an analytical framework adapted from (Kørnøv, Lyhne & Davila, 2020) operationalising the concept of integration into six levels of integration and non-integration (Figure 1).

Results show significant variation between regimes and most of them were observed to only have guidelines. It was observed that at least 11 regimes have strengthened and amended their EIA frameworks by including specific provisions in their EIA related legislations or guidelines and they have displayed a strong integration (climate change based) and at least a minimum acceptable level of integration (climate change testing). Two regimes (the EU and UK) were observed to have both regulations and guidelines while eleven 11 regimes (Canada, USA, Western Australia, Australian Capital Territory and Northern Territory the Caribbean, South Pacific, the Netherland, South Korea, IFC and WB) integrated climate change in their guidelines without amending their regulatory framework (not applicable for IFC and WB). Two regimes (Spain and Austria) have included climate change considerations in their EIA legal framework but haven't developed a guideline. In contrast, this is not the case for some regimes assessed where there remains an aspiration-action gap (e.g., Grenada, South Africa, and Austria).

However, amongst the reviewed, no EIA regime displayed the characteristics of requiring 'climate change led' EIA.

'Climate change based' requirements (Level 5) were observed in both regulations and guidelines from the EU and UK while only in guidelines from Canada, US, Australia (Western Australia, Australian Capital Territory and Northern Territory), the Caribbean and South Pacific regions. 'Climate change based' EIA requirements indicate a strong or 'radical' level of integration where all relevant climate impacts, mitigation and adaptation considerations are required to be integrated and assessed within EIA. The regulations of these regimes explicitly require climate change integration and they have developed guidelines on how to integrate climate change in EIA. As such they provide useful examples of climate change integration in EIA, as elaborated in the Section 5.1.1.1.

Other regimes displayed 'climate change testing.' In these cases, a limited range of climate-related considerations, such as water and air quality that are selected for impact assessment. Also, there were requirements for quantification of CO_2 emissions but with limited substantive requirements for the assessment and evaluation stages of EIA, as observed in South Korea, and the Netherlands guidelines. 'Climate change scoping' indicates when climate change is explicitly mentioned in a regime but only as contextualizing environmental description, there is no identification and thoroughly assessment of potential impacts. Climate change considerations are not used at all or used in very few stages of EIA as seen in the WB and IFC standards and Spain' guidelines.

On the other hand, ‘non-integration’ was also observed in Grenada, Austria, and South Africa. Their EIA regimes do indicate a measure of understanding of the importance of climate change in EIA, with climate change being mentioned in either regulations or guidelines, yet they do not explicitly require the consideration of climate change in the EIA processes. There is a mention of climate change word in the Austrian legal framework but without extensive details concerning integration. Meanwhile, there are no regulations and guidelines in South Africa and Grenada however, they have shown intention to develop a national guideline.

4.2 Notable examples of integration of climate change considerations in EIA

Canada

In November 2003, a Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment released “Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (the Guidance)” to support the integration of climate change considerations in EIA in Canada (FPTCCCEA, 2003) under the Canadian Environmental Assessment Act, 2012 (CEAA, 2012) and its associated EIA regulations (*Regulations Designating Physical Activities, 2012*). The Canadian EIA regulatory regime is supportive of the integration; however, the regulations do not use the word climate change any of the selected climate change -related keywords as described in this study. Thus, climate change is not explicitly integrated in regulations but well integrated in the guidelines and implemented in accordance with the Act.

Thus, Canada has shown the intention to integrate climate change through their comprehensive guidelines development that support the implementation. In the scoping phase, GHG emissions are analysed before a detailed assessment in the EIA phase. Furthermore, the guidance promotes the integration of GHG management plans into other impact areas, such as air and water pollution. Also, it requires practitioners to seek a description of the indirect and direct GHG emissions of the project and related effects, including likely large-scale impacts on carbon sinks (FPTCCCEA, 2003). A radical integration was observed in the Canadian EIA regime by scoring level (5) ‘climate change based’. Canadian guidelines explicitly consider climate change integration in EIA and is integrated in all phases of EIA (except screening phase), also includes important aspects of climate change including GHG emissions. As seen in Table 6, Climate Change Baseline, mitigation, and adaptation are all covered.

Caribbean Community and South Pacific (and Grenada)

Despite having varied domestic EIA regimes and requirements for each member states, the Caribbean Community, and the Secretariat of the Pacific Regional Environment Programme (CARICOM-SPREP) exhibit strong integration requirements. There is a special guidance on the consideration of climate change in EIA prepared by CARICOM-SPREP. These member countries have issued one of the most elaborative guidance notes on climate change integration in EIA in the “Guide to the Integration of Climate Change Adaptation into the Environmental Impact Assessment (EIA) Process” (CARICOM-SPREP, 2004). A high level of integration (5) was observed (climate change-based) which indicates that there is an integration of climate change in all EIA stages and the guidance covers both mitigation and adaptation aspects while assessing most of relevant climate change parameters and their impacts. It defines the inclusion of climate change in the EIA and criteria to evaluate and identify potential impacts along with guidance during the preparation of EIAs, standards of practitioners' experience and qualifications (CARICOM-SPREP, 2004).

Apart from that there are some initiatives made at the national level. For instance, CARICOM-SPREP (2004) reports that Grenada has some integration level of climate change in its EIA regime. There is not a designated EIA regulation in Grenada which undermines implementation of the EIA process. The Act that governs EIA in Grenada is *Physical Planning and Development Control Act, 2002* and it allows impact assessment of the project to integrate likely impacts, environmental risks, mitigation and monitoring of the impacts. Nevertheless, it does not explicitly mention climate change. In Grenada, climate change consideration for specific projects is decided during the EIA review committee by using the relevant information. Furthermore, the Government of Grenada (GoG) made considerable progress to integrate climate change into EIA (Government of Grenada, 2017). A need to report climate change impacts and adaptation measures in EIA has already been integrated in Grenada. To promote integration, the terms of reference for EIA will be revised; the development of the guidance document on how to consider climate change into EIA is also underway (Government of Grenada, 2017). Currently, at a national level, this groups Grenada into a 'non- integration' category where level (2) 'climate change dropping' was observed. Climate change is not explicitly mentioned in the legal framework, and it does not detail how to go about it. However, Grenada's regime shows strong intention to integrate climate change, but it is also lacking a proper guidance at a national level.

European Union (and Spain, the Netherlands & Austria)

The idea of climate change integration into EIA and SEA directives was first recommended in the White and Green Papers on climate change adaptation in Europe Directive 2014/52/EU (EU, 2014). It is a mandatory requirement for all countries under the European Union (EU) to integrate climate change with other environmental considerations within EIA process (Agrawala et al., 2012). The EU has a strong level of climate change integration 'climate change based' (Level 5) has been displayed in both, regulations, and guidelines.

Directives 2014/52/EU (Annexes III(1)(f), IV(5)(f)) was approved to integrate climate change into EIA, together with the special guidance for the EU, "the Guidance on Integrating Climate Change and Biodiversity into EIA which provides guidance on how to integrate climate change and biodiversity in EIAs" (EU, 2014; European Commission, 2013). These initiatives were launched to give additional instruction to the practitioners of the member states. After the revision of the since May 2017, it is mandatory to integrate both, mitigation, and adaptation measures to climate change in EIA prepared in all the 28 EU Member States (Jiricka-Pürrer, Alexandra, Wachter & Driscoll, 2019). The Guide underlines the necessity of integrating climate change at an early stage of EIA process (screening and scoping) and throughout the entire process.

In Spain for example, climate change integration must be considered in EIA and SEA while is different in the EU where mandatory in EIAs only. The obligation to integrate the impacts on climate existed since the first European Union and Spanish EIA regulations, though without clear reference to climate change. In 2013, Spain approved one of the most advanced laws (*Law 21/2013*), although it had not yet gathered extensive practice (Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016; *Law 21/2013*). The *Law 21/2013* anticipates EU (2014) stipulating the regulations and requirement to integrate climate change consideration in EIA. However, the integration is legal obligation, and it has not received enough experience yet to make a relevant consideration especially without a guideline to facilitate the integration. Despite having a legal obligation to integrate climate change in EIA, it is not explicitly integrated among all the potential significant impacts that any EIA must consider (Enríquez-de-Salamanca, Martín-Aranda & Díaz-Sierra, 2016). This might be caused by lack of guidelines for implementation which led to a 'partial integration' scoring level 3, "climate change-scoping". Both mitigation and adaptation are integrated but not throughout the process as seen in the results table and assessment of impacts is not clear.

In Austria, climate change mitigation was considered in EIA before the EU (EU, 2014) but adaptation to climate change was given less attention (Jiricka-Pürrer et al., 2019). In Austria, the EIA is governed by the *Environmental Impact Assessment Act, 2000* which also regulates the implementation of the EIA process. It comprises a list of 88 types of projects that are potential for adverse environmental impacts and EIA study is to be conducted if certain provisions apply, nonetheless climate change consideration is not explicitly integrated. The word "climate" is mentioned but contextualised as an environmental description. Climate change integration in the Austrian regime is still a challenge and only practiced to a limited extent (Jiricka-Purrer et al., 2016; Jiricka-Purrer et al., 2018). Apart from being obliged by EU (2014), the Austrian regime is not explicitly integrating climate change in their local EIA legislations and do not have guidelines that are specific for the integration. Hence, this explains why climate change integration in EIA practice is still underdeveloped. With the support of literature from scholars including Jiricka-Pürrer et al. (2019), a non-integration requirement 'climate change-dropping' (level 2) was scored.

In Netherlands, climate change integration is implicitly considered in the *Environmental Management Act, 2004* and its associated regulations, *Environmental Management Activities Decree, 2007* . However, the Netherlands has also been known to integrate climate change in EIA. For instance, the Netherlands Commission on Environmental Assessment (NCEA) is a private organization that provides guidance and advice to the government on this topic (Agrawala et al., 2010). Though, more attention has been given to SEA than EIA, NCEA acknowledges the role of climate change integration in EIA and specifically to ensure that climate change adaptation is considered. The NCEA recommends use of a stepwise approach; assessing climate change risks, to assess project's compliance with the objectives of government policy plans for climate change and the last one being consideration of the climate-robust alternative measures as well as mitigation measures that contribute significantly to GHG emissions (Draaijers & van der Velden, 2009). The NCEA requires projects that contribute significantly to the GHG emissions to be paid attention to and provided with appropriate mitigation measures. In such cases, insight must specifically be provided into GHG (Draaijers & van der Velden, 2009). It has also considered adaptation information should be given on how the initiative can address climate change risks: how the risks can be limited, how the quality of life, the spatial quality and the safety can be maintained and enhanced. Climate change adaptation must be considered in different sectors and places, importance of considering interaction between the adaptation and mitigation measures. However, the NCEA recommends EIA to have a separate section for climate change integration and not in every stage of EIA (Draaijers & van der Velden, 2009). 'Climate change testing' (4) was scored in this regime.

United Kingdom (UK)

It is a legal requirement in the UK to consider GHG emissions within EIA processes and the report must provide information on how a project will contribute to the achievement of the GHG reduction targets. The EIA in UK is governed by the Town and Country Planning (EIA) Regulations 2017 (the '2017 Regulations'). These regulations are normally referred to as the 'EIA Directive' (*Town and Country Planning (EIA) Regulations 2017*). Schedule 3, regulation 5(6) 1 gives selection criteria for development screening. It requires developers to consider all relevant risks including climate change risks. Also, schedule 4 regulation 2(1) mandates climate change as a valuable information to be included in EIA statements. Furthermore, there is a guideline on climate change integration in EIA which was developed by the UK Environment Agency (EA) (EA, 2011) however, the guide is not effective. The Institute of Environmental Management and Assessment (IEMA) has also issued a guide about EA and climate change (IEMA, 2015; IEMA, 2020). The first edition of "the IEMA EIA Guide to Climate Change Resilience and Adaption" was published in 2015; it provides a framework for the effective integration in line with the 2014 EU Directive (IEMA, 2015). The guidance was developed to guide UK developers and practitioners to understand the new requirements that were coming after the implementation of the EU amendments Directive in the UK regulations in 2017. The revisions do specifically refer to 'climate change' and the need to integrate climate change explicitly is established through amendments to Annex IV. The updated version of the guide was launched in 2020 and has been updated based on developments in practice (IEMA, 2015; IEMA, 2020). The guide requires climate change integration to start during the screening stage all the way to the EMP (climate change adaptation plan). When using the guide, the developer is always required to integrate and explain how resilient the project is to climate change. How climate change impact assessment has been done and define the significance of impacts by practically considering the knowledge base used in the impact assessment (IEMA, 2015; IEMA, 2020). A radical integration level 5 'climate change-based' was scored in the UK's regime.

USA

Consideration of climate change in the US EIA regime was a legal requirement until the update to the Regulations Implementing the Procedural Provisions of the NEPA in 2020 under the President Trump (*National Environmental Policy Act (NEPA) Regulations, 2020*). However, the issue of climate change integration appeared in the USA in 1997 when the Council on Environmental Quality (CEQ) released a first guidance draft and updated it in 2010 as per NEPA (CEQ, 1997; CEQ, 2010; CEQ, 2016; *National Environmental Policy Act, 1969*). The integration in the USA follows the CEQ Guidance "Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews" (2016 GHG Guidance) as per NEPA requirement and implemented by CEQ NEPA regulations (CEQ, 2016; *National Environmental Policy Act, 1969*). The consideration of climate change in the US starts at the scoping stage to help decide whether the analysis is relevant and, if so, the extent of analysis. Moreover, the guidance instructs how to analyze GHG emissions when they are likely to exceed 25,000t of CO_2-e per year and even less than that in long-term projects. Despite the recent amendment to the regulations, climate change integration in EIA is explicitly required in the CEQ guidelines and the level of integration scored is (5) 'climate change based'. The integration covers both mitigation and adaptation measures whereas relevant parameters of climate change such as GHG emissions are included in almost all stages of the EIA process.

Australia (Western Australia (WA), Northern Territory (NT) and the Australian Capital Territory (ACT))

There is not a common framework for climate change integration at a project level in Australian EIA regime. But planning authorities in some Australian states and territories have shown some initiatives (Agrawala et al., 2010). Climate change is not a legal requirement in Australia, the existing EIA regulations do not explicitly integrate climate change in EIA. Nevertheless, guidelines are available in these states/territories to help practitioners prepare EIAs with the inclusion of GHG emissions as a significant environmental issue to assess.

In WA, *Environment Protection Regulations 2020 (WA)* is the one responsible for the implementation and overseeing of environmental management including EIAs. However, climate change is not explicitly mentioned. Currently, WA has published its new Guideline for GHG Emissions (GHG Guideline) under WA Environmental Protection Authority (EPA) (WA EPA, 2020). NT has a brief but comprehensive guide called "Northern Territory Government EIA Guide: GHG Emissions and Climate Change (NT, 2011) under the *Environment Protection Act 2019 (NT)* and its subsidiary *Environmental Protection Regulations 2020* . Despite that, the NT EIA regulations do not explicitly consider climate change. The NT Guide requires GHG estimations and assessment for the operation and construction phases, details of the proposal lifecycle GHG and its efficiency, impact assessment and provision of the mitigation and adaptation measures. On the other hand, the ACT's guide called "Triple Bottom Line Assessment for the ACT Government" under the *Environment Protection Act 1997 (ACT)* and implemented by *Environment Protection Amendment Regulation 2021 (No 1)* . Likewise other states, climate change is implicitly considered in ACT EIA legal regime

All three territories are dedicated to the integration of GHG emissions and climate change in EIA through guidelines and demonstrated a high level of integration (5), climate change based. Each guidance considers almost all of climate change parameters, covers almost all stages of the EIA process. Both guidance require that project proponents assess and estimate GHG emissions in all stages of the proposed project, detail the project lifecycle GHG emissions and the GHG efficiency of the project and establish consideration of efficiency and mitigation measures. They also allow monitoring of the established measures, investigation, review and reporting of GHG emissions and reduction measures and the programme should be well outlined. Finally, climate change impacts on the project must be considered. It appears that all projects in Australia must comply with these guidelines. However, this study selected the WA Guide to present other Australian territories since it has the most recent guidance.

South Korea

Consideration of GHG emissions caused by development projects has been integrated in the South Korean EIA regime. This was implemented by the Ministry of Environment (ME) under the EIA Act. However, this requirement is not being conducted appropriately within existing EIA practice (Kim & Kim, 2021) and one of the reasons could be that the *Enforcement Decree of the EIA Act, 2017* does not explicitly include climate change considerations as it is responsible in regulating the Act. South Korea has a well elaborative guideline and is referred as "Ministry of Environment Guide" (ME Guide) (ME, 2015). Although, it is a non-binding requirement, the integration of climate change in Korean EIA regime is explicitly required and its inclusion can be considered during scoping depending on the nature of the project, size, and its significance. The Guideline gives more extensive assistance to EIA practitioners to incorporate fuller consideration of offset of GHG emissions and climate change mitigation. It requires evaluation and assessment of GHG emissions in EIA, however, it does not consider all GHG emissions generated throughout the life cycle (Kim & Kim, 2021). Also, the guideline does not integrate climate change in all stages of EIA, thus a partial integration, Climate change-testing (level 4) was observed.

South Africa

The South African EIA regime is governed by the *National Environmental Management Act No. 107 of 1998* (NEMA) alongside EIA Regulations and Listing Notices, 2017. Section 24 of NEMA requires an environmental authorization to conduct listed activities. Additionally, 2017 EIA regulations provide a Listing Notice for the activities that EIA is mandatory, including any activity that emits GHG, such as burning fossil fuel. Also, these regulations provide for the minimum requirement during EIA processes through appendices (*Environmental Impact Assessment Regulations, 2017*). However, climate change is not explicitly integrated in these regulations and in the listing notices. The results show that the existing EIA legal regime fails to include assessment of climate change despite acknowledging it as an environmental problem. Thus, a "non-integration requirement observed. It scored level (2), "climate change- dropping' as the regulations do not detail how to address its impacts, they are not integrated in any stage of the EIA process and not tested for in identification of potential impacts as was observed in the Thabametsi case in section 5.2.5. However, when interpreting Section 24 of NEMA, the South African situation is unique as discussed in detail in section 5.1.2. Moreover, South Africa has shown an intention to explicitly include climate change and soon will launch its first guideline.

Multilateral organizations (World Bank (WB) and International Finance Corporation (IFC))

Numerous organizations have also advocated for incorporation of climate change into EIA. In addition to domestic requirements, the WB and IFC which are sister organisations and members of the World Bank Group (WBG) have published several guidelines to help environmental practitioners during EIA. IFC is focused completely on the private sector in developing countries (IFC, 2012) while the WB provides financing, policy advice, and technical support to governments of developing countries (World Bank, 2016).

On its part, IFC has established a set of guidelines corresponding to the Performance Standards on Environmental and Social Sustainability (IFC, 2012), which could also play a significant role in addressing climate changes challenges at the project level, however, there is not much focus on how to assess climate change impacts including GHG emissions on a project level. A partial integration (3) "climate change- scoping" was scored because the guide takes the climate change as a general environmental issue and no clear methodology of assessing climate change-related impacts. Furthermore, it also allows quantification of direct and indirect GHG emissions from the project, but they are not thoroughly assessed, and it does not give specific entry points to include climate change issues.

On the other hand, the WB acknowledges climate change to be an important issue to be considered in the update and review of its safeguard policies. It should be integrated at different levels in projects (World Bank, 2016). The Environmental and Social Framework (ESF) was revised in 2017 and became effective in 2018. The EFS enhances the WB's obligation towards sustainable development through ten Environmental and Social Standards (ESS) that intended to support borrowers' environmental and social (E&S) risk management. At the project level, the WB addresses "project-level impacts on climate change and considers the impacts of climate change on the selection, siting, planning, design and implementation and decommissioning of projects" (World Bank, 2016). At the scoping stage, climate change is considered as one of the social and environmental impacts to be integrated in the EIA. In the Community Health and Safety standard, the WB identifies that communities already exposed and subject to climate change risks may experience amplification of impacts due to the proposed project activities. Infrastructure structural design must also integrate climate change considerations where applicable. To conserve ecosystem services, the borrower must identify climate change risks and implement suitable measures for mitigation (World Bank 2017). The EIA must also integrate projected climate change risks to biodiversity (World Bank, 2016). However, the WB standard does not describe how and where these considerations can take place in EIA. Like the IFC, a partial integration (3) "climate change- scoping" was also observed because of the similar reasons.

4.3 GHG emissions assessment as an important factor for integration

Assessment of GHG emissions is very important when considering climate change in EIA. It aims to avoid climate change impacts in advance due to GHG emitted during the development of the project (Kim & Kim, 2021). Many EIA regimes acknowledge the importance of EIA for

GHG emissions (e.g., Canada). GHG emissions associated with individual projects are often categorized into three “scopes;” Scope 1, Scope 2, and Scope 3 where GHG emissions are assessed throughout the project life cycle (planning, construction, operation, and monitoring phase) (WA EPA, 2020). The direct and indirect GHG emission within the range that can be directly controlled by the project is called Scope 1 and Scope 2, respectively. According to Kim and Kim (2021), GHG emissions coming from the burning of fuels on-site are regarded as Scope 1 and the ones generated from the electricity production and steam supplied on-site in upstream activities are regarded as Scope 2. However, where there is no direct control of generated GHG emissions, these are referred to as indirect GHG emissions named Scope 3. The last category involves GHG emissions emitted from the manufacturing materials and fuels supplied on-site and from the operating and dismantling of the building. These scopes are important as they affect the level of integration of climate change mitigation aspects in EIA although this grouping was designed only for commercial purposes and was not for EIA purposes. According to Kim and Kim (2021), other regimes do not include and assess all 3 scopes which can result wrong decision-making. However, some regimes have adopted it in their EIA, for example South Korea. The South Korean Guideline requires evaluation and assessment of GHG emissions in EIA, however, not all GHG emissions generated during the proposed project life cycle are included. The guideline assesses only scope 1 and 2, excluding scope 3.

In Canada, EIA requirements include calculation and evaluation of GHG emission generated from all 3 scopes generated in the entire project’s lifespan (Kim & Kim, 2021). The USA has also been assessing GHG emissions using these scopes in EIA. Similar to Canada, the USA calculates and evaluates GHG emissions for Scopes 1, 2, and 3 generated throughout the project’s development (Geißler, Köppel & Odparlik, 2011). Moreover, the EU guideline also suggests and promotes evaluation and assessment of GHG emissions throughout the project’s lifecycle (European Commission, 2013). The same was observed in Western Australia and CARICOM-SPRES. These regimes that require GHG emissions assessment as a part of EIA have also shown a high level of integration throughout the EIA process and included EIA requirements that are ‘climate change based.’

Canada, the EU, USA, CARICOM-SPRES and Western Australia were selected as an example that other regimes can learn from their best practices of integration. They integrate and assess all relevant climate impacts including GHG emissions for all scopes, mitigation, and adaptation.

4.4 Conclusion

A review of 16 EIA regimes finds there is a growing and international requirement for climate change considerations to be explicitly considered in EIAs. This indicates that the tool of EIA has a role to play in local level climate governance. Table 1 illustrates the range of EIA regimes, regulations, and guidelines, mapped against the possible levels of integration. The Table illustrates that the development of requirements for climate change considerations in EIAs, whilst becoming a recent global trend, is still nascent. Few cases indicate climate change considerations have had a substantive effect on EIA decision-making and subsequent outcomes of proposed developments. This is the case even for regimes that were found to have a higher level of integration requirements within their guidelines and regulations. Nonetheless, going forward, a greater influence of climate change considerations on EIA outcomes is anticipated with higher levels of integration. However, the frequency of occurrence of climate change-related terms does not indicate the quality of the requirements. It can, however, be expected that if meaningfully addressed, climate change would be frequently referred at all important stages (such as the scoping, impact assessment, final decision, and review stages) and for sectors with significant GHG emissions (such as energy; transport; agriculture). The levels scope where ambitious EIA regimes may extend towards 'radical integration' depending on the relevance of climate change to potential impacts and regulatory appetite for implementing climate action through EIAs.

5 DISCUSSION

This chapter discusses the findings of the analysis of the literature review, regulations, and guidelines across 16 EIA regimes. It identifies tenets of best practice and provides explanation on the variety of ranges of levels of integration of climate change considerations across these EIA regimes. The discussion is firstly structured according to levels of integration established through the analytical framework. It starts with discussion of the characteristics of EIA regimes which display higher levels of integration, or 'radical integration,' where a broad range of climate change aspects are systematically included in EIA with substantive influence on the overall assessment. Similarities across these regimes are highlighted to emphasise what is potentially more generalisable at this higher level of practice. This is then followed by examples of 'partial integration' where a limited range of climate change aspects are included in EIA, and then cases of 'non-integration'. The discussion then presents the various stages in EIA where climate change is explicitly considered across the EIA regimes analysed, highlighting how some EIA regimes only require climate change to be considered at certain stages in an EIA and not others with implications for how seriously climate change is integrated with other environmental dimensions in EIA. Observations of expectations set out in guidelines and regulations identify potential entry points within EIA process for integration.

Development of requirements for climate change considerations in EIA is a recent global trend and is now embedded in regulations and guidelines across the world (e.g., in US, EU, Canada, Western Australia and CARICOM-SPRES). This development is nascent, and few cases indicate climate change considerations have had a substantive effect on EIA decision-making and subsequent outcomes of proposed developments. Nonetheless, greater influence of climate change considerations on EIA outcomes is anticipated with higher levels of integration (Agrawala et al., 2012).

These findings indicate integration is strongest in regimes where all relevant climate change considerations are explicitly required, including identification of parameters (temperatures, wind, precipitation), assessment of GHG emissions (scope 1, 2, & 3), impacts, measures for mitigation, and adaptation, and where these aspects are considered across all stages of an EIA. Despite mentioned criteria, the most common consideration is that climate change impacts are quantified through GHG emissions measurements and used to compare alternatives. However, this expectation is currently beyond the legal requirements and scope of most EIA jurisdictions, particularly in those regimes with high-carbon energy or transport sectors (Byer et al., 2012). Furthermore, Yi and Hacking (2012) have argued that a full integration of climate change should incorporate climate impacts, mitigation, and adaptation; however, as observed in this study absence of regulatory requirement may delay and prevent this (Ulibarri & Scott, 2019).

One of the core challenges is the lack of scientific consistency and failure to predict and assess project-level GHG emissions together with their effects on climate change (Kamau & Mwaura, 2013; Yi & Hacking, 2012). However, as seen in the results section, some regimes including Western Australia, CARICOM-SPRES regions, USA, Canada, and EU have explored that area and have included an assessment of GHG emissions at a project level and were therefore selected as benchmarks. Many efforts have been made to reduce GHG emissions from Scope 1 and 2 which are directly controllable, but not from Scope 3 which is uncontrollable (Kim & Kim, 2021). Therefore, in addition to efforts to address Scopes 1 and 2 that can be directly controlled by their own individual projects, attention is also needed to address GHG emissions from Scope 3 activities considering climate change is recognized as a global environmental challenge and not only a regional or localised problem. As mentioned above, there are regimes that are following the trend to manage GHG Scope 3 emissions that the project itself cannot control. These regimes can set an example for others to follow. Section 5.1.1.1 gives details for these six selected regimes for the best practices.

5.1 Important lessons for integration

This section explains the important lessons learned from the literature review and selected EIA regimes. It briefly illustrates the lessons from the best practices which are those regimes that exhibited a radical integration (Level 5) ‘climate change based’ and lessons from other forms of integration, partial and non- integration.

5.1.1 Levels of integration and non-integration

Analysis of EIA regimes used an analytical framework adapted from (Kørnøv, Lyhne & Davila, 2020) operationalising the concept of integration into six levels of integration and non-integration (Figure 1).

5.1.1.1 Radical Integration

No EIA regime displayed the characteristics of being 'climate change-led’, a level of radical integration where the potential expansion of EIA’s scope to the project-level assessment of advanced climate science, for instance, climate model downscaling or climate change attribution. This level would require significant ambition to go beyond the existing EIA regime and would require significant investment in project-relevant climate science. This level (6) may neither be possible nor practical under existing and near-term scientific and regulatory arrangements.

On the other hand, Canada, UK, EU, Western Australia, USA, Caribbean, and South Pacific countries displayed characteristics of ‘climate change-based’ where relevant climate change impact, mitigation and adaptation considerations expected to be integrated within EIA. This level of integration can be adopted by other countries as the best practices. However, there are some interesting observations noticed in some of these regimes that displayed a high level of integration. For instance, there is a difference between requirement and the practice in the UK EIA regime. This is being justified by Hands and Hudson (2016) in their study to see how climate change is integrated in UK EIAs in various sectors. The study also revealed that most references to climate change were in the rationale for the development and in the policy context. Furthermore, measures to mitigate and adapt to climate change were inconsistently integrated, which conforms with IEMA’s findings of a current lack of proper guidance in climate change integration in EIA process (Hands & Hudson, 2016; IEMA, 2015). And, in the sample studied, climate change considerations were generally not explicitly considered in different stages of an EIA and there is a lack of monitoring and obligation towards the recommended measures. Despite having mandatory requirement and guidelines specific for integration, the implementation in the EIA process is still not at its best.

Nevertheless, the above-mentioned regimes have exhibited high levels of integration of climate change in EIA that set an example to other regimes as benchmarks. While most regimes do not explicitly mandate climate change integration and their regulations do not use or explicitly mention climate change or related words, their governments support it and robust guidelines have been established as seen in Canada, the US, Western Australia, Caribbean, and South Pacific. A summary of guidelines and regulations for the 6 selected regimes that exhibited high levels of integration of climate change in EIA (Canada, EU, Western Australia, USA, Caribbean, and South Pacific) is shown in Table 7 below.

Table 7: Summary of guidelines and regulations for regimes exhibiting high levels of integration of climate change consideration in EIA

Regime	Regulation	Guideline	Guideline Content
Canada	Canadian Environmental Assessment Act (CEAA, 2012) CEA (Regulations Designating Physical Activity), 2012	Canadian Environmental Assessment Agency (CEAA), Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (2003)	• It requires the project proponent to conduct a scoping process for climate change impacts and vulnerability and a more thorough impact assessment where appropriate. • It guides on how to conduct climate impacts evaluation and vulnerability of the project during environmental reviews • It also underlines steps for the EIA process • Incorporates and requires assessment of GHG emissions throughout project life cycle
Caribbean & South Pacific	Country Specific	CARICOM-SPREP, Guide to the Integration of Climate Change Adaptation into the Environmental Impact Assessment (EIA) Process (2004)	• This guide provides 11 key steps for integrating climate change effects in EIA in Caribbean-SPREP countries • Provides information to the EIA process considering climate change adaptation considerations • Assesses cumulative and synergistic effects • It provides guidance around climate change hazard management, development planning and EIAs • It emphasises on climate change adaptation and monitoring plan • It elaborates about the assessment of the cumulative climate change effects and the EIA process • It gives possible mechanisms for climate change integration into EIA within each country in CARICOM-SPRES • It provides guide to address scientific uncertainty using risk management procedures to
European Union	Directive 2014/52/EU (2014)	European Union (EU), Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013)	• Integrates climate change into early stages (screening and scoping) of EIA • Acknowledges the importance all relevant stakeholders into decision-making • Understand how climate change interacts with other issues covered by the EIA • Consider the complex nature of climate change and the potential for cumulative impacts • Include extreme climate situations and potential big surprises • Assess synergies and cumulative impacts, which can be significant. • It requires EIA to address "the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge" and "the vulnerability of the project to climate change. • It underlines overarching principles as well as pragmatic considerations for addressing climate change mitigation and adaptation as well as biodiversity in EIA. • Provides a list of key questions for identifying climate change adaptation issues and lists the considerations that should factor into the assessment of how climate change will impact the environmental baseline, the vulnerability of built infrastructure, and adaptation opportunities. • Incorporates and requires assessment of GHG emissions throughout project life cycle
USA	The National Environmental Policy Act of 1969 (NEPA) CEQ NEPA Regulations, 2020	Council on Environmental Quality (CEQ), Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews" (2016 GHG Guidance)	• Incorporates and requires assessment of GHG emissions throughout project life cycle • Discusses and integrates methods to appropriately analyse direct, indirect, and cumulative GHG emissions and climate impacts • Recommends that EIA practitioners use projected GHG emissions as a proxy for assessing potential climate change impacts • Guides the consideration of project's alternatives and recommends consideration of the short- and long-term impacts and benefits in the project alternatives and mitigation analysis
Western Australia (WA)	Environmental Protection Act 1986 (WA) (EP Act) Environmental Protection Regulations 1987 (Amended on 2020)	Environmental Factor Guideline for Greenhouse Gas Emissions (2020 GHG Guideline)	• Outlines how and when the GHG Emissions factor is considered for integration by the EPA in the EIA process. • Outlines the information required to conduct EIA related to GHG emissions factor (including integration of scope 1,2&3) • Outlines projects that GHG emissions to be considered • Gives details on how GHG emissions factor links with other factors of the environment • Explains EIA considerations for GHG emissions factor • GHG emissions will be assessed where they surpass 100,000 tonnes of scope 1 emissions each year measured in CO_2e • Requests information on measures to avoid, reduce and offset GHG emissions • Requires proponent to develop a GHG Management Plan and periodic monitoring of the Plan

Canada

The CEAA has issued one of the best guidelines to assist effective EIA process (CEAA, 2012; Mayer, 2019a). However, the guide is only used to provide guidance and is not a substitute the Act and its regulations, and it was not established to suggest changes to the EIA process introduced in the CEAA (2012). As seen in the results, climate change is not explicitly mentioned in the EIA regulations despite the development of the guide as they were not designed to consider climate change. This indicates that, change of the legal framework might take time to accommodate new initiatives, hence development of guidelines is important. Furthermore, the guideline indicates high level of integration, "climate change-based (5) and is applicable across jurisdictions (FPTCCCEA, 2003), hence can be adapted to other regimes.

The guide focuses on the GHG component where it assesses and evaluates the GHG emissions contribution of the proposed development, and it also focuses on the impacts component where it assesses how the projected climate change impacts may adversely impact the project. Climate change in Canada is not integrated into the screening phase, hence not taken as a preliminary factor that could initiate an EIA (see Table 6). According to Christopher (2007), this might be due to the difficulty in identifying the impacts on climate change of any single activity and the fact that climate change is just one of the factors to be weighed against others within EIA. Nonetheless, Canada has pioneered in this developments and it has become a global benchmark (Agrawala et al., 2012). In Canada, climate change is initiated in the scoping phase and requires consideration thereafter (FPTCCCEA, 2003). The guidance requires the proponent to conduct EIA and address GHG emissions by using the following steps: scoping, identification of GHG emissions, impacts assessment, identification of mitigation measures and follow-up including monitoring plan (FPTCCCEA, 2003; Luke & Noble, 2019).

Furthermore, the guideline is designed to be generic, acknowledging the jurisdictional differences in EIA procedures around the world. The guidelines presented are for the EIA practitioner to adapt and customize it to local circumstances and requirements giving room for mitigation and measures for adaption to climate change. As seen in Guideline No. 13, it requires a developer to address mitigation measures specific to climate change impacts including direct GHG emissions, their intensity and magnitude, direct effect on large-scale carbon sinks and if possible, to include any suitable adaptation measures in the EIA mitigation section as well as a management plan (FPTCCCEA, 2003).

Also, Guideline No. 11 requires the use of the same criteria for significance to examine potential impacts of the environment on the project as used in the assessment of the impact of the project on the environment (FPTCCCEA, 2003). Moreover, like the EU, to evaluate the project sensitivity, Canadian guidelines include a range of relevant climate parameters including temperatures, sea level, precipitation, evaporation rate and wind velocity, leaving room for specific parameters to be applied under specific circumstances. The inclusion of these relevant climate parameters in EIA helps to increase integration effectiveness and to avoid making wrong decision.

Caribbean & South Pacific

The CARICOM-SPREP EIA guide was not designed to change existing EIA by establishing a new EIA process instead it identifies and proposes a few simple procedures to consider when using existing traditional EIA processes (CARICOM-SPREP, 2004). For instance, Section 2 gives details to follow when considering climate change impacts such as evaluating potential impacts from the proposed project to identifying and analysing potential climate impacts on the proposed project. The guide requires climate change integration in all stages of EIA, starting from the screening phase to implementation monitoring. It also recommends examining project alternatives and the provision of appropriate mitigation measures and management of adaptation plans. Furthermore, sections 3, 4 and 5 of the Guide give guidance on practical mechanisms that can be used to maximize climate change integration in EIA at the national level in the CARICOM and SPREP. The Guide acknowledge a need to develop and strengthen EIA systems in individual countries by the provision of post mechanisms to integrate climate change considerations into EIAs at the National Level – Caribbean and South Pacific regions (CARICOM-SPREP, 2004). Moreover, unlike others, this guideline has put more emphasis on cost-benefit analysis to establish the economic viability of proposed adaptation measures. In this regard, this Guide can also be adopted by other regimes.

European Union

The EU has amended its legislation to include climate change considerations. Climate change integration is explicitly required in EIA by the EU, and it is mandatory to all member states. The EU has launched two practice guidelines about the potential of incorporating climate change and biodiversity in decision-making tools (SEA and EIA) (European Commission, 2013). It was seen in the guidelines that EIA has the potential to address climate change impacts as well as associated adaptation measures within existing modalities of EIA procedures. This amended guideline checks for both the potential impact of the project on environment (climate change) and climate change on the project by assessing its GHG emissions and it also acknowledges the vulnerability of the long-term and large-scale investment infrastructure projects to climate change impacts (European Commission, 2013). In many cases, the EIA process established by the EU will need modification in all Member States and the established guidance helps developers on how to improve this. For example, the conflict prior to Brexit over a Heathrow runway extension (Bell & Fisher, 2020; Mitchell, 2020). These developments have been motivated in the literature (Agrawala et al., 2012; Byer et al., 2012; Walker, Haasnoot & Kwakkel, 2013), particularly in conjunction with SEA. The European Commission (2013) and scholars such as Fischer and Sykes (2009) believes the integration to be more effective in existing decision-making tools such as EIA and SEA than to develop separate or new assessment tools.

The regulatory and guideline expectations present the characteristic of a 'climate change-based' level of integration. The EU guideline recognises the importance of climate change integration in all stages of EIA and most importantly at the initial stages of screening and scoping. In the screening process, EIA practitioners through a set of questions set by the Guide get to identify if proposed projects have potential significant climate change impacts or be significantly affected by it (European Commission, 2013). However, no clear criteria are provided. The amended Directive mentions climate change adaptation as one of screening factor, but it does not explicitly consider mitigation as a screening criterion. Nonetheless, this is not the case for everyone (Wentz, 2015) and others urge that the deciding factor should be established on the quantity of a global GHG emission that can be attributed to a particular action. However, the complicated nature of climate change makes it difficult to attribute impacts to any single activity or point source making the principle of considering cumulative impact of multiple activities or projects particularly important.

Like the Canadian guideline, the EU guideline classifies a range of key climate parameters including temperatures to integrate during the EIA process. But it should be noted that every case is different, and the checklist should be tailored to a specific project (European Commission, 2013). In addition, the guide recommends and provides methodologies for evaluation and assessment of all GHG Scope 1, 2 (direct) and 3 (indirect) emissions. In contrast to the Canadian guideline where it recommends that considerations should be given to, where appropriate (FPTCCCEA, 2003).

Equally therefore, the EU guideline can be adopted to other regimes. However, according to Christopher (2007), there are theoretical and practical challenges concerning the consideration of climate change impacts that are indirect, local, long-term, cumulative, or transboundary. The Guide, therefore, suggests the identification of an evolving baseline, to apply significance criteria instead of magnitude standard as well as the application of network analysis or causal chain (European Commission, 2013).

USA

Climate change integration was a legal requirement in the US regime. However, as seen in the results, the amended CEQ NEPA 2020 regulations do not include such a requirement. The 2020 NEPA gave a requirement to agencies to focus on evaluation of “reasonably foreseeable impacts rather than categorizing them as “direct,” “indirect,” or “cumulative” (*National Environmental Policy Act (NEPA) Regulations, 2020*). The effects of climate change on a proposed development would no longer be considered and the analysis will be contingent on the specific circumstances of a proposal. Under the final rule, practitioners will integrate foreseeable environmental changes in the baseline analysis of the impacted environment ” (*National Environmental Policy Act (NEPA) Regulations, 2020*). Nevertheless, the 2020 amendments led to implementation challenges for agencies. Hence, to restore this, in January 2021, President Biden insisted on building climate change resilience in the US. CEQ is reviewing the 2020 NEPA regulations and plans to publish a proposed notice to identify necessary revisions to comply with the law and to meet climate change and environmental justice objectives. The proposed regulations again explicitly require that agencies integrate indirect, direct, and cumulative environmental impacts of a proposed project (NEPA, 2021).

NEPA itself does not explicitly require climate change integration into EIA but guidance from CEQ outlines what agencies should consider when integrating climate change in EIA. Climate change-based requirements were observed in the CEQ guide, and its implementation is in accordance with NEPA. The Guide shows how to fulfil NEPA's mandates for agencies to integrate the GHG emissions of proposed developments (Wentz, 2015). The first draft was released in 2010 confirming that climate change is relevant, and it falls within the scope of NEPA. In 2016, CEQ issued final guidance for climate change integration with NEPA’s principles because analysis of climate change considerations and other environmental impacts should be similar under NEPA. This requirement conforms with scholars including Flynn and Smith (2010) who argued that GHG emissions, and their related impacts are exactly the kind of cumulative impact analysis needed by the NEPA. Also, Pyke and Batten (2008) recommended that the consideration of global warming effects should be compulsory in EIA as per the NEPA requirement, which stipulates the authority and procedures to directly address them. As a result, climate change integration in EIA brought so much awareness and according to He (2021a), empirical studies of litigation show that, the number of cases brought under the NEPA, and state impact assessment laws are high in the US.

The guide assists agencies with the requirement and to ensure their analysis of potential GHG emissions and associated impacts in environmental assessments matching the extent of the impacts of the proposed project (CEQ, 2016). The guide recommends that practitioners quantify GHG scope 1, 2 and 3 emissions of a proposed project, considering the availability of data and tools for GHG quantification and their suitability for the project (CEQ, 2016). In 2019, the “Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions” was released for public participation. In January 2021, CEQ was directed to withdraw the 2019 draft and bring forth the 2016 GHG guidance for its review, revision, and update. However, the removal of the guidance document does not change or amend any regulation, law, or other legally binding requirements. CEQ will issue in a separate different notice for its review of and any suitable amendments and updates to the 2016 GHG Guidance (NEPA, 2021).

In the USA, climate change considerations start in a scoping phase which determines the relevance and the extent of the analysis (Wentz, 2015). The guide underlines a benchmark point of 25,000mt CO_2e per year as a recommended threshold for qualitative and quantitative analysis of GHG emissions. Likewise, the US GHG Guidance can be adopted in other countries.

Western Australia (WA)

Like the above-mentioned regimes, ‘climate change based’ was also observed in the requirements of the Western Australian (WA) EIA regime and it can be adopted in other regimes. On 16 April 2020, the Environmental Protection Authority (EPA) in Western Australia (WA) issued its new Guideline for GHG Emissions (GHG Guideline) under the Environmental Protection Act 1986 (WA EPA, 2020). The GHG Guideline is not legally binding but to provide and promote clarity, transparency and consistency for developers, the public and other stakeholders in the EIA process under Part IV of the EP Act, 1986. It reflects EPA’s approach to considering GHG emissions in EIA. The guideline highlights when and how GHG emissions will be a key environmental factor and how it will be dealt with in the

EIA reports. It also outlines how and when the EPA will consider GHG emissions in the EIA process for a proposal referred to it for assessment under the Act. Also, the Guideline contains more comprehensive references to the IPCC’s Special Report on Global Warming of 1.5°C, which covers up-to-date scientific findings on the climate change impacts associated with various and current global warming scenarios (WA EPA, 2020).

The Guidelines intend to inform and assist the development and assessment of a proposed project, not determine the outcome of the EPA's assessment. In the end, each individual project is assessed on its merits. There is not a legal binding requirement in these guidelines regarding EPA assessments; they are explicitly not aimed to be predictive of EPA advice. Furthermore, the guideline requires a proponent during GHG emissions assessment to consider the following among others for the EIA process: GHG emissions reduction and Management Plan, the adoption of best practice and whether the proposed mitigation actions are reasonable and practicable. Also, the EPA directed that the GHG emissions will generally be applied and assessed in projects that surpass 100,000 tons of scope 1 per year and has instructed that developer may be requested to provide estimates for scope 1, 2 and 3 emissions (annual and total) throughout the project’s lifespan. However, the guideline did not provide the weight that will be given to these estimates in the EIA process (WA EPA, 2020).

5.1.1.2 Partial integration

Levels within this category are (4) ‘climate change testing’ and (3) ‘climate change-scoping’. Partial integration indicates “weak” integration of climate change.

‘Climate change testing’ has been observed in regimes such as the Netherlands and South Korea. This level of integration refers to a limited range of climate-related considerations, such as water and air quality (including assessment of CO_2 footprint) that are selected for impact assessment. This is the minimum level of integration that can be adopted by other regimes with the intention of advancing it into a radical integration. The South Korean EIA regime has exhibited this level; however, the regime does not consider scope 3 GHG emissions. For the best decision-making during EIA, a regime must consider both indirect and direct emissions (Scope 1,2 and 3).

On the other hand, ‘climate change-scoping’ refers to EIA requirements that include climate change explicitly, but only as contextualizing environmental description and not tested for in identification of potential climate change-related impacts as seen in Spain, WB and IFC standards. An interesting finding was observed in Spain regime where a notable difference between legal requirement and practice was seen in Enríquez-de-Salamanca, Martín-Aranda and Díaz-Sierra (2016) study. Despite having one of the best laws for climate change integration in EIA, the results revealed that 14% of 1713 EIA projects included reference to climate change while in more than half of the projects was a mere citation, or it is a simple quantification of CO_2 emissions (not all GHG are considered) which is not used at all in every stage of the EIA. Also, climate consideration was highest in thermal projects, but they were lacking as they did not consider each stage of the EIA. Very low consideration was observed in transport infrastructure despite being major contributors to GHG. All references paid attention to their contribution to climate change and less to its impact. This points out the importance of having a guideline to assist the implementation.

On the other hand, IFC's Performance Standards (PS) could also play an important role in addressing climate change challenges at the project level. However, there is not much focus on how to assess climate change impacts including GHG emissions on a project level. For instance, PS1 focuses on environmental and social risks and impacts assessment and management which could be a great opportunity to integrate climate change impact assessment on a project level as well. PS3 deals and highlights the importance of efficient use of resources and prevention of pollution, including GHG emissions (IFC, 2012). It also shows emphasis on the importance of reducing of proposed project related GHG emissions at the early stage of project development such as design phase as well as during operation phase by provision of appropriate project alternatives, mitigation, and adaptation measures. All projects that surpass 25,000 tonnes of CO_2e annually, the standard requires a developer to quantify scope 1, 2 and 3 GHG emissions generated throughout project's lifecycle. This standard could be an entry point for the integration of the climate change impacts assessment, mitigation, and adaptation, as it is very useful into reducing the projected atmospheric concentration of GHG. However, the standard does not detail what to do after the quantification of the emissions. PS4 acknowledges the increased exposure and contribution of proposed project activities and infrastructure to climate change risks especially to the surrounding community. This is because, the exposed and vulnerable communities may also experience acceleration and intensification of impacts due to proposed activities and exuberate the situation. On the other hand, PS6 emphasises on protecting and conserving biodiversity, ecosystem services, and sustainably managing natural resources because they are fundamental to sustainable development (IFC, 2012).

5.1.2 Non-integration

Non-integration means there is no requirement for climate change consideration in the EIA. Levels within this category are (1) 'climate change washing' and (2) 'climate change dropping'. Despite having intentions to integrate climate change in EIA, their EIA regimes do not provide specific guidance for the implementation. Their EIA regimes do indicate a measure of understanding of the importance of climate change in EIA, with climate change being mentioned in either regulations or guidelines, yet they do not explicitly require the consideration of climate change and not used in any stage of the process in the EIA processes.

More specifically, 'climate change washing' can include where aspects relating to climate change are misrepresented in the EIA, for example, through manipulation or greenwashing. No regime was observed to have this kind of integration in this study. 'Climate change dropping' refers to where climate change is mentioned in EIA but not explicitly used in any stage of the process as seen in Austria and South African EIA regime.

Austria have displayed a climate change dropping requirement where climate change is only mentioned in the baseline phase as environmental description. This conforms with the study of Jiricka-Purrer et al. (2018) where she observed few cases make explicit reference to potential projected impacts on the project and consideration of climate change aspects occurred only at specific phases such as in a baseline, rather than throughout the whole EIA process and they don't include impact assessment and management plan of measures and future influence of climate change.

Climate change dropping was also observed in South Africa. However, their situation is unique. In South Africa's case, when Section 24 of NEMA is read, the requirement that climate change must be considered in an EIA is "relevant", even though it does not expressly use the words climate change. This is because the courts have interpreted it in such a way that it can include climate change considerations but not expressly referred to in NEMA. The courts require practitioners to read the words climate change into the act even though it doesn't expressly provide for this. The requirements of the courts to do this is binding because South Africa has a common law system and is required to interpret the law as the courts have. This was justified in the Thabametsi case (5.2.5), that the law does require climate change to be considered even though Section 24O of NEMA doesn't use the words climate change. Thus, practitioners must read it as if it did. However, this study analysed regulations and guidelines that explicitly integrate climate change and make mention of climate change or its related words. For that reason, South Africa's EIA regime shows a climate change dropping requirement.

Furthermore, the South African EIA legal system is ambitious and has shown intention to integrate climate change. For instance, there are emerging guidelines and policies that orient EIA towards climate change imperatives. South Africa will soon launch its long-awaited Climate Change Bill, the first comprehensive legal framework for climate change. The Bill will be a major step for South Africa's transition to a greener economy and towards addressing climate change (DFFE, 2021a). The first draft was launched in June 2018; however, the Bill did not explicitly provide directives on how the inclusion of climate change can be considered in EIA. Section 7 of the Bill requires that climate change considerations be included in decisions, policies, plans and programmes of the provincial, national, and local spheres (*Climate Change Bill*, 2018). This motivates an amendment of the EIA regulations to consider climate change since EIA content and process is predominately governed by legislation in South Africa.

Furthermore, the South African EIA regime has recently issued a notice inviting consultation regarding the publication of the National Guideline for climate change considerations in environmental authorizations (the "Guideline") (DFFE, 2021b). The Guideline has been issued in response to recent case law (Thabametsi case) which demonstrates that climate change is a relevant consideration in certain environmental-related applications and decision-making processes (Levetan & Anstey, 2021). The case law illustrates a recent and influential shift in jurisprudence and recognition that climate change is a relevant consideration and within the scope of EIA in South Africa. The guideline recognizes the need to integrate climate change impacts, both mitigation and adaptation at a project level and this will increase awareness of GHG emissions and associated impacts and encourage consideration of more environmentally friendly technologies for the proposed developments (DFFE, 2021b).

5.2 Climate Change integration in each phase of EIA

As explained briefly in Table 1, the EIA process involves several stages for direct integration of climate change in EIA including screening, scoping, impact assessment, EIA review, environmental management plan, and monitoring. This section will explain how climate change is required to be integrated at different stages of the EIA process and draws on some bright spots identified in the range of EIA regimes to highlight examples of how this can be done in an integrated way. Each phase has its importance in terms of climate change integration in EIA as they establish a build upon logical continuum and coherent information base for the final decision-making. The FPTCCCEA (2003) has highlighted how an EIA report should be and proposed several entry points for climate change considerations and the dangers of excluding climate change from key points in the assessment process. EIA can consider climate change-related issues through identifying existing and future climate baseline scenarios, impacts assessment and their synergistic implications, considerations of project alternatives, measures to mitigate and adapt climate change, public and stakeholders' involvement and consultations must take into account for climate change-related discussions (Byer et al., 2012; EU, 2014; IEMA, 2015; Posas, 2011; Yi & Hacking, 2012). The results show some regimes indicating high levels of procedural integration including CARICOM and SPRES have considered climate change throughout the EIA process. Other regimes including the Netherlands and Austria have considered it in a limited range of the phases (e.g., only during screening or scoping), and regimes including South Africa, climate change is not explicitly mentioned in any of these steps. The following subsection shows how climate change integration can be considered in each phase of EIA.

5.2.1 Screening phase

Screening the project for its needs and justification is a very first step that involves the initial identification of important hazards and impacts of climate change. Screening is an important phase in European Commission (2013), because practitioners get to consider if GHG emissions can be used as a criterion for integration and whether is likely to be significantly enough to initiate EIA, and finally proposing appropriate mitigation measures that the developer has agreed to. IEMA (2015) guidance also details the same that attention to climate change can start at the screening stage. During project screening, it may be possible to include an initial inspection of whether the project scope requires consideration of environmental impacts relevant to climate change before reaching the scoping stage, where critical issues are identified for the detailed assessment. The use of an Environmental Screening Tool, with a high level of screening can potentially help to identify projects that require climate change and other aspects including the nature of the development, sensitivity, and location. For instance, South Africa has its Environmental Screening Tool, a National Web-based environmental screening tool that allows a project proponent expecting to apply for environmental approval to conduct a screening process for any environmental sensitivity (DFFE, 2017). It also provides a site-specific EIA process and reviews information and related requirements, including specialist studies applicable to the proposed development, based on the national sector classification and the environmental sensitivity of the site (DFFE, 2017). This could be an entry point for climate change while taking in other environmental considerations. Together with a well-developed guideline, this screening tool will help the EA practitioner conduct EIA processes with climate change in mind and enable integration in EIA studies.

5.2.2 Scoping phase

IEMA (2015) suggests that the best practice to integrate climate change in EIA is to scope GHG emissions into the assessment and provision of appropriate mitigation measures. This also conforms with FPTCCCEA (2003) guidance where it proposes climate change integration during the scoping stage. After it has been established that full EIA is required, the need for a full-scale assessment of climate change impacts may be assessed as part of the EIA scoping, where only key issues are identified. The CEAA guidance provides issues to consider when integrating climate change in a scoping stage, including legislative requirements and applicable regulatory requirements. In addition, the nature of the project, its location, duration and climate change resilience, identification of the key climate-related thresholds that are likely to influence the project, expected changes to those climatic parameters over project's lifespan and how sensitive the environment is to being affected by the proposed project to those identified climate parameters are also included (IEMA, 2015; IEMA, 2020). Additionally, participation by stakeholders in the scoping phase is likely to provide a basis for integrating relevant climate change issues. The scoping phase would also be a good entry point for determining whether the climate risks related to the project extend beyond the project itself and potentially have feedback effects on the community and environment. The CEQ (2016) also illustrates climate change inclusion at the scoping phase where the relevance and the extent of the analysis are determined.

5.2.3 Climate change baselines and EIA

Assessment of the environmental baseline is an integral part of the EIA process as it explains the existing environmental scenarios and act as a reference point against which the impact of a proposed project can be compared against. One of the main objectives of assessing and evaluating mitigation and adaptation is to decrease GHG emissions and enhance the resilience of projects against climate change effects. Yet EIA allows assessment of the baseline environment; hence it is a potential tool for baseline adaptation which is a precondition that helps to set adaptation measures (Jiricka-Purrer et al., 2016; Larsen, Kørnøv & Wejs, 2012). Nevertheless, climate change adaptation and baseline adaptation have received less attention in the EIA than climate mitigation measures. It is important to consider environmental baseline because environmental baseline assessments are affected by climate change. It constantly affects the environment, resulting in constant changes in the characteristics of the environment. Therefore, as seen in CARICOM-SPREP (2004) and European Commission (2013), the assessment of the environmental baseline should consider climate change-related changes in the environment, including projections into the lifetime of the proposed activity and the length of receiving environmental effects.

5.2.4 Impact assessment phase

In this phase, FPTCCCEA (2003) recommends the assessment of GHG emissions to determine indirect and direct GHG emissions and effects on carbon sinks; also, assessment of impacts of climate change on the project and risks to the society and environment. European Commission (2013) also recommends this phase to include assessment of significant synergies and cumulative impacts. On the other hand, WA EPA (2020) highlights about including the assessment of the impacts associated with GHG including scope 1 & 2 and where applicable scope 3 emissions. Moreover, it is emphasising on the minimum requirement of GHG emissions to be assessed yearly. This phase is an important entry point to account for climate change impact on the project because the project's potential impacts on the environment are identified, thoroughly examined, and measures to manage these potential effects are proposed. Natural hazards are considered, their likely effect on the project and possible impacts on the risks led by the project. The current environmental condition is developed, against which the assessment of the project's environmental performance is based. As seen in the previous section, the baseline environment is also used to monitor the project's compliance during its implementation stage and allows identifying a baseline for the relevant climatic variables of the project. Agrawala et al. (2012) propose that climate change risk assessment experts and relevant climate data must be available to consider relevant climate vulnerabilities for the proposed project.

5.2.5 EIA review

EIA review is important to ensure all relevant factors have been considered by the relevant authorities. EIA review helps evaluate the quality of information contained in an EIA report and decide if the information is adequate for decision-making. This ensures all relevant considerations are incorporated, including climate change. A review process and stakeholders' involvement are very crucial in the EIA process as it helps to bring awareness to those who are indirectly and directly affected by the project so they can raise their concerns before decision-making. For instance, the review of the Thabametsi EIA report was necessary as it led to a court case because of their inadequacy in integrating climate change considerations, even though NEMA requires considering all types of potential impact. The following section briefly explains the importance of the EIA review phase and how it contributed to the awareness of climate change integration in EIA in South African EIA regime.

The Thabametsi Case: Jurisprudence on climate change consideration in EIA

The Thabametsi power plant was a proposed coal-fired power station project with 1,200-megawatt (MW) capacity located in Limpopo province, South Africa. Environmental approval was granted in March 2015 after the EIA process. However, the approval was then appealed by two environmental NGOs claiming that the environmental authorization was granted without considering the climate change impacts assessment. They argued that a proper reading of section 24(O) of NEMA mandates that an impact assessment including impacts arising from climate change be undertaken and considered before the environmental authorization, on the basis that it was a 'relevant' consideration for the EIA (van der Bank & Karsten, 2020).

The appeal called for the Minister of Environmental Affairs (MEA) to suspend the authorization to construct the proposed plant until a full assessment of climate change impact was done. Following the appeal, a full climate change impact assessment was undertaken, and the project was found to have significant GHG emissions compared to the existing oldest coal plants. The court's decision was then to withdraw the Environmental Authorization (EA) on grounds that the potential climate-change impacts of the proposed development were a 'relevant' consideration for Section 24(O) of NEMA within the scope of the EIA and that the interpretation of NEMA must be in line with the environmental protection of the Constitution of South Africa. In this landmark case, the judgment failed to give further guidance on how this can or should be done (van der Bank & Karsten, 2020). Nonetheless, the Thabametsi case played a vital role in setting the precedent for climate change consideration to be addressed in EIA. South Africa is now about to launch its first guidance that will help EA practitioners to integrate climate change in EIA.

5.2.6 Environmental management plan (EMP)

The EMP includes preparing construction and operational environmental management plan if the project is allowed for implementation. In that case, measures to reduce environmental impacts from an activity are integrated into the project's design and employed through EMP. Any appropriate measures to adapt to climate change impacts that have been recognized in the earlier stage may also be integrated into these implementation plans. Yet EMPs are not usually intended to tackle the impacts of climate change. Accordingly, to integrate climate change adaptation, the plan should be established within the EIA procedure to handle significant climate changes that will impact the project and outline adaptation plans that will be developed to deal with climate change effects relevant to the project activities (CARICOM-SPREP, 2004). For instance, in WA EPA (2020) requires the proponent to apply this guideline to develop GHG Management Plan during project assessment. At a minimum, EMP should detail intended reductions of GHG emissions scope 1 over the project lifespan and applicable and practicable measures applied at each stage of the mitigation hierarchy.

5.2.7 Monitoring programme

This phase involves following up on what has been implemented. Monitoring and assessing the anticipated impacts and management of a project. WA EPA (2020) requires proponents to monitor and periodically report against their proposed measures as outlined in their GHG Management Plan. Also, CARICOM-SPREP (2004) guidelines recommend that during this stage, the team of EIA should establish and develop a Climate Change Monitoring Programme and take part in the Climate Change Adaptation Programme. The monitoring programme results should help build a database for guidance, assess, and improve climate change adaptation measures and be required for project evaluation activities. Moreover, FPTCCCEA (2003) highlights that climate change-related awareness, policy, technology, and legislation are developing. Hence, it may be appropriate for projects with longer lifespans to consider climate change as part of the follow-up programme. The monitoring programme will increase the efficacy of climate change integration in EIA practice.

5.3 Challenges of climate change integration in EIA

Climate change integration into EIA processes is neither a straightforward nor an easy task. Thus, climate change challenges and opportunities are not fully integrated in EIAs. This study has observed barriers and drivers for the uptake and advancing climate change integration in EIA. This study has noted the following challenges

- Climate change is not explicitly integrated in most of regulations. Changing a legal framework might takes long time to implement.

- There are various setbacks in establishing a standard guideline for EIAs to handle climate change impacts. For example, in the EU context, practitioners have faced significant difficulty in determining how to include and effectively account for climate change uncertainties in projects analysis (Agrawala et al., 2012; Davoudi, Crawford & Mehmood, 2009; FPTCCCEA, 2003; Refsgaard et al., 2013).

- Another challenge is to decide when and how climate change considerations become initiated within an EIA process. Most of regimes do not integrate climate change throughout the EIA process. Some were only included in few stages of EIA or not integrated at all.

- No regime was observed to have a ‘climate change led’ characteristics. The reason may be because there is limited access to past and future climate information, climate models, and an absence of interaction between the scientist and EIA practitioners (Agrawala et al., 2012).

- Also, most of the reviewed regimes do not integrate assessment of GHG emissions, however, EIA also assess, and at times employ ways of alleviating environmental effects. But due to the cumulative nature of GHG emissions, until recently it has been difficult to estimate a substantial amount of GHG with reasonable precision. Yet defining ‘significance’ is very significant in the context of EIA to climate change (Ehrlich & Ross, 2015; Lawrence, 2007).

- Climate change is perceived to be a separate issue from the integration of the potential impacts of a proposed project. That is why climate change is currently implicitly integrated in most of reviewed EIA regimes. Furthermore, EIA was customarily designed to handle more straightforward and localized environmental impacts. Consequently, these challenges have resulted in the wrong assumption that EIA cannot address climate change's multifaceted challenges (Aljareo, 2014).

- Other challenges observed in some regimes including China are the absence of government policy, motivation to tackle climate change; lack of political action; inadequate capacity of EIA; absence of expertise and appropriate EIA tools (Wamsler et al., 2020).

5.4 Conclusion

The results have shown that there is a wide variety of regulatory and guideline expectations for climate change to be integrated in EIAs across the 16 regimes assessed. Low performing regimes indicate challenges of consistency and raise questions over the substantive contribution of EIAs for local level environmental governance. In contrast, high performing regimes hold exemplars of regulation and practice guidelines which are potentially informative for greater consistency and depth of consideration.

Regulations and guidelines play an important role in establishing standards and norms for the practice of EIA. However, the practice of EIA does not necessarily match regulations or guidelines, nor the fundamental principles behind their establishment as set out by the IAIA. This chapter discusses a range of the practice challenges observed in the literature and reflect on the importance of guidelines and regulations to enhance integration of climate change considerations in EIAs. A summary of guidelines and regulations for the six selected regimes that exhibited high levels of integration of climate change in EIAs (EU; Caribbean and South Pacific; Western Australia; USA). These findings indicate integration is strongest in regimes where all relevant climate change considerations are explicitly required. This includes the identification of parameters (temperatures, wind, precipitation), an assessment of GHG emissions, impacts, measures for mitigation, and adaptation, and where these aspects are considered across all stages of an EIA. Despite the potential range of these criteria, the most common consideration is that climate change impacts must be quantified through GHG emissions measurements and compared against alternatives. However, even this obligation currently goes beyond the legal requirements of most EIA jurisdictions, particularly in those regimes with high-carbon energy or transport sectors.

6 CONCLUSIONS AND RECOMMENDATIONS

This chapter provides the most important findings of this research together. First, section 6.1 reflects on whether the main research questions were successfully answered and shows that the goal of the study was achieved. Then followed by the concluding remarks on this research presented and future research directions identified in section 6.2. Finally, recommendations for climate change integration in EIA are discussed section 6.3

6.1 Summary of the results

This section briefly explains research questions and their answers.

i. **Across a range of EIA regimes, to what extent and how do existing regulations and guidelines require consideration of climate change in EIA?**

Through a review of 16 EIA regimes, this study examined the extent of how climate change is integrated in EIA. A consistent theme has emerged around the need for regulations and guidelines to regulate and guide climate change integration into EIA. This aligns with Sok, Boruff and Morrison-Saunders (2011) who indicated that regulations and guidelines are especially significant at every stage of the EIA process. It also extends the finding of Byer, Philip H and Yeomans (2007) that lack of regulations is a barrier to climate change integration. The findings indicate that the best approach for EIA to consider climate change integratively is to have climate change specific regulations that trigger EIA processes and specify a clear basis for enforcement with support of guidelines.

No regime scored 'climate change led' (6) in their regulations or guidelines. Level 5 of integration requirement 'climate change based' was scored in the regulations or guidelines of nine regimes including Canada, WA, ACT, NT, USA, EU, Caribbean, South Pacific regions, and the UK. Of these, only two regimes (the EU and UK) have both regulations and guidelines that are explicitly require climate change and it is integrated in every stage of EIA. The other seven regimes have only established guidelines that specifically require climate change inclusion in EIA and their regulations are not explicit on climate change. All nine regimes considered climate change across a range of phases of the EIA process and GHG emissions assessment were used for the considerations of the project alternatives.

Regulations or guidelines that only required weak or partial integration were observed in four EIA regimes. "Climate change testing" (4) was observed in South Korea and the Netherlands guidelines where there is a limited range of climate-related considerations that are selected for impact assessment, such as water and air quality. Also, there were requirements for quantification of CO_2 emissions but with limited substantive requirements for the assessment and evaluation stages of EIA. Regimes including Spain, WB & IFC standards were assessed to display characteristics of 'climate change scoping' (3) which is when climate change is explicitly mentioned in a regime but there is no identification and thorough assessment of potential impacts. In these cases, climate change considerations are not used or used in very few stages of EIA.

Three regimes scored a non-integration which means there is no requirement for climate change consideration in the EIA. “Climate change dropping” (2) was observed in Grenada, South Africa, and Austria. Despite having intentions to integrate climate change in EIA, their EIA regimes do not provide specific guidance for the implementation nor regulations. Their EIA regimes do indicate a measure of understanding of the importance of integration, yet they do not explicitly require climate change consideration in their EIA guidelines and regulations. Apart from that, no regime scored a ‘climate change washing’ (1) requirement which is expected of guidelines and regulations as it is a metric of practice performance rather than normative expectation. This would occur where aspects relating to climate change are misrepresented in the EIA, for example, through manipulation or greenwashing.

ii. What guidance can be obtained from these EIA regimes to potentially advance integration of climate change considerations in EIA?

Six regimes including Canada, WA, USA, EU, the Caribbean and South Pacific regions were selected as their regulations and guidelines explicitly require climate change integration in each stage of EIA. Their guidelines have highlighted a clear methodology example of practices that other regimes can learn from. These were selected because the level of specification of GHG emissions assessment used to determine project alternatives (section 5.1.1.1). Their regimes indicated high level of integration (5) ‘climate change based’. For instance, FPTCCCEA (2003) requires the project proponent to conduct a scoping process while considering climate vulnerability and impacts and a thorough impact assessment where appropriate. Also, it guides on how to conduct evaluation of climate impacts and vulnerability of the project during environmental reviews. On the other hand, CARICOM-SPREP (2004) provides 11 key steps for integrating climate change effects in EIA which can be adapted to other countries. It also assesses cumulative and synergistic effects. The European Commission (2013) emphasises on integration of climate change considerations into screening and scoping stages of EIA and acknowledges the importance of all relevant stakeholders into decision-making. Also, it gives an understanding on how climate change interacts with other important aspects including social and how they are covered in EIA process, and it describes a list of key questions that helps to identify adaptation measures and highlights the considerations to be used as a factor during the assessment of how climate change will influence changes in the baseline environment, the vulnerability of built infrastructure, and adaptation opportunities. On the other hand, CEQ (2016) incorporates and requires assessment of GHG emissions throughout the project life cycle. It discusses and integrates methods to appropriately analyse direct, indirect, cumulative GHG emissions and climate impacts. It also recommends the use of predicted GHG emissions as a factor for potential climate change impacts assessment. WA EPA (2020) outlines projects that GHG emissions are to be considered, outlines how and when the GHG Emissions factor is considered in the EIA process and outlines the information required to conduct EIA related to GHG emissions of scope 1, 2 and 3. It requires proponent to develop a GHG Management Plan and periodic monitoring of it. Finally, although not a model of regulatory or guideline development, the South African EIA regime is also instructive for regimes lacking in both. In that case, judicial activism has shown that jurisprudence at the EIA review stage can affect transformations to an EIA regime through establishing precedent for climate change consideration in EIA and lead to, for example, the development of practice guidelines.

6.2 Conclusions

Overall, the results show that climate change integration in EIA is a new but necessary challenge for the practice. Through assessment of integration levels (radical, partial, and non-integration), this research has identified that within 16 regimes reviewed, impacts of climate change, mitigation, and adaptation explicitly integrated in a variety of EIA guidelines, as well as in various stages of an EIA. In contrast, there remain multiple regimes with no requirement for climate change consideration in EIA in their EIA regulations. One of the reasons for this could be that the EIA regulations were established in an era where climate change was not widely considered and integrated, and the focus of EIA was to achieve development approval.

Climate change integration is not required in many jurisdictions. For example, in the USA, practitioners are not legally required to address climate change in EIA, however, guidelines from governments including CEQ and private organizations including IEMA advise them to integrate GHG emissions and associated impacts. This study identified only the EU and UK have a specific legal requirement that EIA should integrate climate change. Many other regimes in this study provide guidance for practitioners conducting an EIA but do not require explicit integration in their regulations.

There is a general lack of management and monitoring plans towards the proposed measures, inadequate or no assessment of GHG emissions and they are not used for project alternatives considerations. Appropriate considerations of project alternatives can serve as mitigation and adaptation measures. However, in most regimes, there was no consideration in respect to adaptation, and the lack of consideration of adaptation undermines EIA process as far as climate change integration is concerned.

This study has identified that lack of climate change integration in EIA is mainly caused by the absence of obligatory requirements, guidance, and experience of integrating climate change, along with the linear process of EIA. However, more measures are required including practical guidance, training, motivational programmes for practitioners and creating awareness in all EIA stakeholders.

6.3 Recommendations

There are several challenges when integrating climate change considerations in the EIA. The following recommendations are made in relation to the identified challenges and scope potential foci of future research directions, regulatory development, and practice guidelines:

> Legislative reform can provide detailed provisions within regulations on how to address climate change and a guiding framework for explicit integration of climate change is required. Such reforms can target higher levels of integration where EIAs can be

'climate change based' or 'climate testing' or set minimum standards of integration above requirements for 'partial integration'.

Climate change should be integrated holistically as a consolidative part of the EIA not constrained to only one or two steps in the process.

Explicit requirements for consideration of climate change adaptation and integration of climate change mitigation and adaptation measures are needed to balance current emphases on GHG mitigation.

Establish and strengthen post-decision monitoring of climate change impacts. Environmental Management Plans need periodic monitoring by frequently assessing and updating knowledge concerning environmental changes, climate trends and baselines. A monitoring plan could be a form of mitigation in itself, as this could identify and establish unexpected adverse impacts and ensure applicable measures are employed.

Regulations and guidelines need to have broad sectoral coverage and not exclude certain sectors, particularly those with greatest relevance to climate change including energy production, transport, mining, infrastructure, and housing.

Greater alignment between integration of climate change considerations in EIA and those in SEA is needed.

Development of a high-level screening tool that is sectorally and geographically calibrated to local climate change information needs of EIA practitioners to identify likely climate change aspects is needed.

7 REFERENCES

Abdul-Sattar, N. 2007. *Comparative analysis of the EIA system of developed and developing countries: Cases of hydroelectric power plants.* Environmental System Analysis, Chalmers University of Technology.

Agrawala, S., Kramer, A.M., Prudent-Richard, G. & Sainsbury, M. 2010. "Incorporating climate change impacts and adaptation in Environmental Impact Assessments: Opportunities and Challenges" OECD Environmental Working Paper No. 24. 10.1787/5km959r3jcmw-en. DOI:10.1787/5km959r3jcmw-en.

Agrawala, S., Kramer, A.M., Prudent-Richard, G., Sainsbury, M. & Schreitter, V. 2012. Incorporating climate change impacts and adaptation in environmental impact assessments: Opportunities and challenges. *Climate and Development.* 4(1):26-39. DOI:10.1080/17565529.2011.628791.

Aljareo, A. 2014. How is climate change incorporated into Environmental Impact Assessments (EIAs) in South Africa? Masters Thesis, University of the Witwatersrand.

Bell, J. & Fisher, E. 2020. The 'Heathrow' Case: Polycentricity, Legislation, and the Standard of Review. *The Modern Law Review.* 83(5):1072-1085. DOI:https://doi.org/10.1111/1468-2230.12555.

Byer, Cestti, R., Croal, P., Fisher, W., Hazell, S. & Kolhoff, A. 2012. Climate change in impact assessment: International best practice principles. In *Special Publication Series No. 8.* International Association for Impact Assessment.

Byer, P.H. & Yeomans, J.S. 2007. Methods for addressing climate change uncertainties in project environmental impact assessments. *Impact Assessment and Project Appraisal.* 25(2):85-99.

CARICOM-SPREP. 2004. *Adapting to a changing climate in the Caribbean and South Pacific regions. Guide to the integration of climate change adaptation into the Environmental Impact Assessment (EIA) process*. Barbados. Available: https://www.commissiemer.nl/docs/mer/diversen/os_guide-integration-climatechange-adaptation-eia-sept2004.pdf.

CEAA. 2012. *Canadian Environmental Assessment Act, 2012.* Canada.

Draft Guidance Regarding Consideration of Global Climate Change in Environmental Documents Prepared Pursuant to the National Environmental Policy Act, 1997. Available: http://www.boem.gov/uploadedFiles/BOEM/Environmental_Stewardship/Environmental_Assessment/ceqmemo.pdf.

Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions, 2010. Available: http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf.

CEQ. 2016. Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews Available: https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf [6/08/2021].

Chang, I.S. & Wu, J. 2013. Integration of climate change considerations into environmental impact assessment — implementation, problems and recommendations for China. *Frontiers of Environmental Science & Engineering.* 7(4):598-607. DOI:10.1007/s11783-013-0496-1.

Christopher, C.W. 2007. Success by a thousand cuts: The use of environmental impact assessment in addressing climate change. *Vt. J. Envtl. L.* 9:549.

Climate Change Act No.11 of 2016. Nairobi: Government Printer.

Climate Change Bill, 580. 2018. Depertment of Environmental Affairs - DEA. Available: https://www.dffe.gov.za/sites/default/files/legislations/climatechangebill2018_gn41689.pdf [5/10/2020].

Davoudi, S., Crawford, J. & Mehmood, A. 2009. *Climate change and spatial planning responses.* Routledge.
DFFE. 2017. *National Web based Environmental Screening Tool.*
DFFE. 2021a. *Important climate change measures for South Africa adopted by Cabinet.*
DFFE. 2021b. *Consultation of Intention to Publish the National for Consideration of Climate Change Implications in Applications for Environmental Authorisations, Atmospheric Emission Licenses and Waste Management Licenses.*
Draaijers, G. & van der Velden, A. 2009. The NCEA's recommendations on climate change in environmental assessment. *Netherlands Commission for Environmental Assessment.*
EA. 2011. *Strategic environmental assessment and climate change: guidance for practitioners.*
Eggenberger, M. & Partidário, M.R. 2000. Development of a framework to assist the integration of environmental, social and economic issues in spatial planning. *Impact Assessment and Project Appraisal.* 18(3):201-207.
Ehrlich, A. & Ross, W. 2015. The significance spectrum and EIA significance determinations. *Impact Assessment and Project Appraisal.* 33(2):87-97.
Enforcement Decree of the EIA Act, 2017. Korea: Government of Korea.
Enríquez-de-Salamanca, Á., Martín-Aranda, R.M. & Díaz-Sierra, R. 2016. Consideration of climate change on environmental impact assessment in Spain. *Environmental Impact Assessment Review.* 57:31-39. Available: https://www.sciencedirect.com/science/article/pii/S0195925515001250.
Environment Protection Act 1997 (ACT). Australian Capital Territory.
Environment Protection Act 2019 (NT).
Environment Protection Amendment Regulation 2021 (No 1).
Environment Protection Regulations 2020 (WA).
Environmental Impact Assessment Act, 2000. Austria.
Environmental Impact Assessment Law, 2002.
Environmental Impact Assessment Regulations, 2017. Pretoria.
Environmental Management Act, 2004.
Environmental Management Activities Decree, 2007.
Environmental Management and Co-ordination Act, 1999 No 8 of 1999
Environmental Protection Law, 1989.
Environmental Protection Regulations 2020.
EU. 2014. *Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.* European Union.
European Commission. 2013. *Guidance on integrating climate change and biodiversity into environmental impact assessment*. Brussels, Belgium. Available: https://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf.
Field, T.-L. 2021. Climate Change Litigation in South Africa: Firmly Out of the Starting Blocks. In *Climate Change Litigation: Global Perspectives.* I. Alogna, C. Bakker and J.-P. Gauci, Eds. Online: Brill
Nijhoff. 173-198. DOI:https://doi.org/10.1163/9789004447615_009.
Fischer, T. & Sykes, O. 2009. The new EU territorial Agenda—indicating progress for climate change mitigation and adaptation. *Planning for climate change, Earthscan.*111-124.
Flynn, H.C. & Smith, P. 2010. *Greenhouse gas budgets of crop production: current and likely future trends. International Fertilizer Industry Association.* Paris, France. Available: https://files.core.ac.uk/pdf/1/177244.pdf.
FPTCCCEA. 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. Available: https://www.canada.ca/content/dam/iaac-acei/documents/policy-guidance/incorporating-climate-change-considerations-

environmental-assessment-general-guidance-practitioners/incorporating-climate-change-considerations-environmental-assessment.pdf.
Füssel, H.-M. & Klein, R.J. 2006. Climate change vulnerability assessments: an evolution of conceptual thinking. *Climatic change.* 75(3):301-329.
Gao, Q. 2018. Mainstreaming climate change into the EIA procedures: a perspective from China. *International Journal of Climate Change Strategies and Management.* 10(3):342-358. DOI:10.1108/IJCCSM-04-2016-0040.
Geißler, G., Köppel, J. & Odparlik, L. 2011. Addressing greenhouse gas emissions in environmental impact assessments—The discursive making of guidance in the united states. *UVP-report.* 25(4):215-221.
Getty, R. & Morrison-Saunders, A. 2020. Evaluating the effectiveness of integrating the environmental impact assessment and mine closure planning processes. *Environmental Impact Assessment Review.* 82:106366.
Glasson, J. & Therivel, R. 2019. *Introduction to environmental impact assessment.* 5th Edition. Routledge. Available: https://www.routledge.com/Introduction-To-Environmental-Impact-Assessment/Glasson-Therivel/p/book/9781138600751.
Government of Grenada. 2017. *National Climate Change Adaptation Plan (NAP) for Grenada, Carriacou and Petite Martinique 2017-2021, Ministry of Climate Resilience, the Environment, Forestry, Fisheries, Disaster Management and Information.*
Greig, L. & Duinker, P. 2014. Strengthening impact assessment: what problems do integration and focus fix? *Impact Assessment and Project Appraisal.* 32(1):23-24.
Hands, S. & Hudson, M.D. 2016. Incorporating climate change mitigation and adaptation into environmental impact assessment: a review of current practice within transport projects in England. *Impact Assessment and Project Appraisal.* 34(4):330-345.
Haroff, K.T. & Moore, K.K. 2007. Global climate change and the National Environmental Policy Act. *University of San Francisco law review.* 42(1):155.
He, X. 2013. Integrating Climate Change Factors within China's Environmental Impact Assessment Legislation: New Challenges and Developments. *Law Env't & Dev. J.* 9:[xv].
He, X. 2021. Mitigation and Adaptation through Environmental Impact Assessment Litigation: Rethinking the Prospect of Climate Change Litigation in China. *Transnational Environmental Law.* 10.1017/S2047102521000108:1-27. DOI:10.1017/S2047102521000108.
IAIA17. 2017. *Impact Assessment's Contribution to the Global Efforts in Addressing Climate Change*. [4-7 April 2017].
IAIA. 2013. Climate Smart Decisions. Available: https://www.iaia.org/uploads/pdf/Fastips_3Climate.pdf [12 December, 2021].
IAIA & IEA. 1999. *Principles of environmental impact assessment best practice*. Faro, USA: IAIA. Available: https://www.iaia.org/uploads.
IEMA. 2015. Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation. Available: *https://www.iema.net › document-download*.
IEMA. 2020. Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation. Available: https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020.
IFC. 2012. *Performance Standards on Environmental and Social Sustainability*. Washington, DC. Available: https://www.ifc.org/wps/wcm/connect/c02c2e86-e6cd-4b55-95a2-b3395d204279/IFC_Performance_Standards.pdf?MOD=AJPERES&CVID=kTjHBzk.
IISD, I.I.f.S.D.-. 2016. Environmental Impact Assessment Training Manual. [15/10/2020].
IPCC. 2013. *Climate Change 2013 – The Physical Science Basis: Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press. Available: https://www.ipcc.ch/report/ar5/wg1/.

IPCC. 2014. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.* [Geneva]: IPCC. Available: https://www.ipcc.ch/report/ar5/syr/.

IPCC. 2018. IPCC, 2018: Summary for Policymakers. In: Global warming of 1.5 C. An IPCC Special Report on the impacts of global warming of 1.5 C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global. *World Meteorological Organization, Geneva, Tech. Rep.*

Jiricka-Pürrer, Leitner, M., Formayer, H., Wachter, T.F. & Prutsch, A. 2019. Mainstreaming climate change adaptation in infrastructure planning—Lessons learned from knowledge transfer and communication. In *Addressing the Challenges in Communicating Climate Change Across Various Audiences.* Springer. 399-416.

Jiricka-Purrer, A., Formayer, H., Schmidt, A., Völler, S., Leitner, M., Fischer, T.B. & Wachter, T.F. 2016. Consideration of climate change impacts and adaptation in EIA practice — Perspectives of actors in Austria and Germany. *Environmental Impact Assessment Review.* 57:78-88. Available: https://www.sciencedirect.com/science/article/pii/S0195925515001262.

Jiricka-Purrer, A., Czachs, C., Formayer, H., Wachter, T.F., Margelik, E., Leitner, M. & Fischer, T.B. 2018. Climate change adaptation and EIA in Austria and Germany–Current consideration and potential future entry points. *Environmental Impact Assessment Review.* 71:26-40.

Jiricka-Pürrer, A., Wachter, T.F. & Driscoll, P. 2019. Perspectives from 2037—Can environmental Impact Assessment be the solution for an early consideration of climate change-related impacts? *Sustainability.* 11(15):4002.

Kamau, J.W. & Mwaura, F. 2013. Climate change adaptation and EIA studies in Kenya. *International Journal of Climate Change Strategies and Management.* 5(2):152-165. DOI:10.1108/17568691311327569.

Kim, K.-T. & Kim, I. 2021. The Significance of Scope 3 GHG Emissions in Construction Projects in Korea: Using EIA and LCA. *Climate.* 9(2):33. Available: https://www.mdpi.com/2225-1154/9/2/33.

Kok, M. & De Coninck, H. 2007. Widening the scope of policies to address climate change: directions for mainstreaming. *Environmental science & policy.* 10(7-8):587-599.

Kolhoff, A.J., Runhaar, H.A. & Driessen, P.P. 2009. The contribution of capacities and context to EIA system performance and effectiveness in developing countries: towards a better understanding. *Impact Assessment and Project Appraisal.* 27(4):271-282.

Kørnøv, L., Lyhne, I. & Davila, J.G. 2020. Linking the UN SDGs and environmental assessment: Towards a conceptual framework. *Environmental Impact Assessment Review.* 85:106463.

Larsen, S.V., Kørnøv, L. & Wejs, A. 2012. Mind the gap in SEA: An institutional perspective on why assessment of synergies amongst climate change mitigation, adaptation and other policy areas are missing. *Environmental Impact Assessment Review.* 33(1):32-40.

Law 21/2013.

Lawrence, D.P. 2007. Impact significance determination—back to basics. *Environmental Impact Assessment Review.* 27(8):755-769.

Lenton, T.M., Rockström, J., Gaffney, O., Rahmstorf, S., Richardson, K., Steffen, W. & Schellnhuber, H.J. 2019. Climate tipping points - too risky to bet against. *Nature (London).* 575(7784):592-595. DOI:10.1038/d41586-019-03595-0.

Levetan, S. & Anstey, D. 2021. Integrating Climate Change Impact Assessments Into The Environmental Impact Assessment Process. *Mondaq business briefing.*

Loza, A.R.A. & Fidélis, T. 2021. 'Literature review on the analysis of climate change risks in the environmental impact assessment of dams'. *Impact Assessment and Project Appraisal.* 10.1080/14615517.2021.1893928:1-13. DOI:10.1080/14615517.2021.1893928.

Luke, L. & Noble, B. 2019. Consideration and influence of climate change in environmental assessment: an analysis of British Columbia's liquid natural gas sector. *Impact Assessment and Project Appraisal.* 37(5):371-381.

Matemilola, S., Adedeji, O.H., Elegbede, I. & Kies, F. 2019. Mainstreaming Climate Change into the EIA Process in Nigeria: Perspectives from Projects in the Niger Delta Region. *Climate.* 7(2):29. Available: https://www.mdpi.com/2225-1154/7/2/29.

Mayer, B. 2019a. Environmental assessments in the context of climate change: The role of the UN Economic Commission for Europe. *Review of European, Comparative & International Environmental Law.* 28(1):82-93.

Mayer, B. 2019b. Climate Assessment as an Emerging Obligation under Customary International Law. *International & Comparative Law Quarterly.* 68(2):271-308.

ME, M.o.E. 2015. *Environmsental Impact Assessment (EIA). Guide on Greenhouse Gas Items; Ministry of Environment.*

Mitchell, E. 2020. Climate change and nationally significant infrastructure projects: R (on the application of Plan B Earth) v Secretary of State for Transport. *Environmental Law Review.* 22(2):125-132.

Morrison-Saunders, A., Pope, J., Gunn, J.A.E., Bond, A. & Retief, F. 2014. Strengthening impact assessment: A call for integration and focus. *Impact Assessment and Project Appraisal.* 32:2-8. DOI:10.1080/14615517.2013.872841.

National Environmental Management Act No. 107 of 1998. Government Printer Pretoria.

National Environmental Policy Act (NEPA) Regulations, 2020.

National Environmental Policy Act, 1969. Council on Environmental Quality

NEPA. 2021. *Guidance on Consideration of Greenhouse Gases.* NEPA.

NT, N.T.G. 2011. *Guidelines for the Preparation of a Public Environmental Report*

Nyarieko, W.I., Nzioka, J.M., Oludhe, C. & Opere, A.O. 2019. Influence of environmental impact assessment in minimizing climate change impacts on transport infrastructure in kenya.

Owen, D. 2008. Climate change and environmental assessment law. *Columbia journal of environmental law.* 33(1):57.

Physical Planning and Development Control Act, 2002.

Posas, P.J. 2011. Exploring climate change criteria for strategic environmental assessments. *Progress in Planning.* 75(3):109-154.

Pyke, C. & Batten, K. 2008. Full Disclosure-An Executive Order to Require Consideration of Global Warming Under the National Environmental Policy Act. *Washington: Center for American Progress, May.*

Refsgaard, J.C., Arnbjerg-Nielsen, K., Drews, M., Halsnæs, K., Jeppesen, E., Madsen, H., Markandya, A., Olesen, J.E. et al. 2013. The role of uncertainty in climate change adaptation strategies—A Danish water management example. *Mitigation and Adaptation Strategies for Global Change.* 18(3):337-359.

Regulations Designating Physical Activities, 2012.

Retief, F., Bond, A., Gunn, J.A.E., Pope, J. & Morrison-Saunders, A. 2014. International perspectives on the strengthening of impact assessment through integration and focus. *Impact Assessment and Project Appraisal.* 32:27-30. DOI:10.1080/14615517.2014.885638.

Retief, F., Bond, A., Pope, J., Morrison-Saunders, A. & King, N. 2016. Global megatrends and their implications for environmental assessment practice. *Environmental Impact Assessment Review.* 61:52-60.

Roy, B. & Schaffartzik, A. 2021. Talk renewables, walk coal: The paradox of India's energy transition. *Ecological Economics.* 180:106871.

Sánchez, L.E. 2014. From neighbors to future generations: we are all together! On integration in impact assessment practice. *Impact Assessment and Project Appraisal.* 32(1):14-16.

Sicango, M.C.T. 2020. Climate Change, Coming Soon to a Court Near You–Report Four: International Climate Change Legal Frameworks.

Sok, V., Boruff, B.J. & Morrison-Saunders, A. 2011. Addressing climate change through environmental impact assessment: international perspectives from a survey of IAIA members. *Impact Assessment and Project Appraisal.* 29(4):317-325. DOI:10.3152/146155111X12959673796001.

Town and Country Planning (EIA) Regulations 2017. UK.

Ulibarri, N. & Scott, T.A. 2019. Environmental hazards, rigid institutions, and transformative change: How drought affects the consideration of water and climate impacts in infrastructure management. *Global Environmental Change.* 59:102005.

Ulibarri, N. & Han, D. 2022. NEPA and climate change: Consideration of climate mitigation and adaptation in infrastructure review processes. *Environmental Research: Infrastructure and Sustainability.* Volume 2, Number 1. Available: https://iopscience.iop.org/article/10.1088/2634-4505/ac5006.

UNEP. 2020. *Global Climate Litigation Report: 2020 Status Review*. (DEL/2333/NA). Nairobi: UNEP.

UNFCCC. 1992. *United Nations Framework Convention on Climate Change : report (to accompany Treaty doc. 102-38).* [Washington, D.C.?]: [U.S. G.P.O.].

UNFCCC. 2003. *National communications from Parties included in Annex 1 to the Convention : compilation and synthesis of third national communications.* Available: http://worldcat.org.

van der Bank, M. & Karsten, J. 2020. Climate Change and South Africa: A Critical Analysis of the Earthlife Africa Johannesburg and Another v Minister of Energy and Others 65662/16 (2017) Case and the Drive for Concrete Climate Practices. *Air, Soil and Water Research.* 13:1178622119885372. DOI:10.1177/1178622119885372.

WA EPA. 2020. *Environmental Protection Authority (EPA): Environmental Factor Guideline: Greenhouse Gas Emissions* Western Australia (WA).

Walker, W.E., Haasnoot, M. & Kwakkel, J.H. 2013. Adapt or perish: A review of planning approaches for adaptation under deep uncertainty. *Sustainability.* 5(3):955-979.

Wamsler, C., Schäpke, N., Fraude, C., Stasiak, D., Bruhn, T., Lawrence, M., Schroeder, H. & Mundaca, L. 2020. Enabling new mindsets and transformative skills for negotiating and activating climate action: Lessons from UNFCCC conferences of the parties. *Environmental science & policy.* 112:227-235.

Wentz, J. 2015. Assessing the Impacts of Climate Change on the Built Environment under NEPA and State EIA Laws: A Survey of Current Practices and Recommendations for Model Protocols. *Sabin Center for Climate Change Law, Columbia Law School.*

Woolsey, P. 2012. *Consideration of Climate Change in Federal EISs, 2009-2011*. New York. Available: http://wordpress.ei.columbia.edu/climate-change-law/files/2016/06/Woolsey-2012-07-Consideration-of-Climate-Change-in-Federal-EISs-2009-2011.pdf.

World Bank. 1999. *The World Bank: Operational Manual OP 4.01, Annex A - Definitions*. Available: http://web.worldbank.org/archive/website01541/WEB/0__-1137.HTM [2020, 14 October].

World Bank. 2016. "World Bank Environmental and Social Framework." World Bank, Washington, DC.

Yi, J. & Hacking, T. Eds. 2012. Gaps in EIA Incorporating Climate Change. Porto, Portugal, 1 June 2012. IAIA. 6.

APPENDICES

7.1 Appendix 1: List of reviewed EIA regulations and guidelines for the assessment

No	Regime	Regulations	Guideline
1	Canada	CEA (Regulations Designating Physical Activity), 2012	Canadian Environmental Assessment Agency (CEAA), Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (2003)
2	Caribbean	Country Specific	CARICOM-SPREP, Guide to the Integration of Climate Change Adaptation into the Environmental Impact Assessment (EIA) Process (2004)
3	South Pacific	Country Specific	CARICOM-SPREP, Guide to the Integration of Climate Change Adaptation into the Environmental Impact Assessment (EIA) Process (2004)
4	European Union	Directive 2014/52/EU (2014)	European Union (EU), Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013)
5	USA	CEQ NEPA Regulations, 2020	Council on Environmental Quality (CEQ), Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews" (2016 GHG Guidance)
6	Western Australia (WA)	Environmental Protection Regulations 1987 (Amended on 2020)	Environmental Factor Guideline for Greenhouse Gas Emissions (2020 GHG Guideline)
7	Northern Territory (NT)	Environmental Protection Regulations, 2020	NT Environmental Impact Assessment Guide: Greenhouse Gas Emissions and Climate Change. Northern Territory Government. Australia, 2009
8	Australia Capital Territory (ACT)	EP Amendment Regulations 2021(no 1)	Triple Bottom Line Assessment for The ACT Government, Framework and Templates
9	UK	The Town and Country Planning (EIA) Regulations 2017	Climate Change Resilience and Adaptation - IEMA, 2015 IEMA EIA Guide to Climate Change Resilience and Adaptation, 2020
10	South Korea	Enforcement Decree of The Environmental Impact Assessment Act, 2017	Ministry of Environment (ME Guide); EIA: Guide on Greenhouse Gas Items
11	The Netherlands	Environmental Management Activities Decree, 2007	The NCEA's recommendations on Climate Change in Environmental Assessment
12	The World Bank and IFC	N/A	The World Bank Environmental and Social Framework Performance Standards on Environmental and Social Sustainability
13	Spain	law 21/2013	-
14	Grenada	Physical Planning and Development Control Act No. 25 of 2002	Not released yet
15	Austria	EIA Act, 2000	-
16	South Africa	NEM: EIA Regulations, 2017	National guideline for consideration of climate change implications in applications for environmental authorizations, atmospheric emissions licenses, and waste management licenses (Not released yet)