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STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) – THE CONCEPT, GENERAL PROCEDURES AND APPLICATION IN GEOTHERMAL RESOURCE DEVELOPMENT

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ABSTRACT

The Strategic Environmental Assessment (SEA) concept is a rapidly evolving approach at the level of policies, plans and programmes aimed at sustainability. The multi-stage approach is gaining popularity as a legal requirement in several countries and can be seen as an extension of Environmental Impact Assessments (EIAs) to facilitate strategic decision making. Recently, SEA approaches have also been introduced by multilateral and bilateral donor agencies and by other international development organisations. As with EIA, these "conditionalities" are becoming an important part of SEA practice in developing countries and a vector for their wider introduction and adoption for domestic applications. This paper provides a detailed description of the SEA process and its application in a geothermal resource expansion programme in Kenya; key recommendations from the SEA indicate that the programme is sustainable if mitigation measures are implemented to the later.

1. INTRODUCTION

The term Strategic Environmental Assessment (SEA) is variously defined and understood. It refers here to a formal process of systematic analysis of the environmental and social effects of development policies, plans, programmes and other proposed strategic actions. This process extends the aims and principles of Environmental Impact Assessment (EIA) upstream in the decision main process, beyond the project level and when major alternatives are still open (Sadler and Verheem, 1996).

SEA represents a proactive approach to integrating environmental considerations into the higher levels of decision making, consistent with the principles outlined in Agenda 21. Often, broader, less detailed assessments are required at these levels compared to project EIA. A comparison of both processes is provided in Table 1. The two processes have common elements, but increasing modification to procedure and methodology are necessary when moving from the project to the policy level.

Presently, very few countries and international organizations have made a formal provision for SEA. These frameworks vary, sometimes considerably and indicate the flexible adaptation of SEA to different levels and types of decision making. According to the present institutionalization, SEA is a multi-stage process that encompasses a spectrum of approaches and diverse arrangements, procedures and methods. These include EIA based environmental appraisal and integrated policy and planning systems, and range in emphasis from assessing the impact of implementing a policy or plan to applying SEA iteratively to build environmental aspects throughout the formulation of a proposed approach.

TABLE 1: Some comparisons between EIA and SEA (CSIR, 1996)

EIA of projects	SEA of policy, plans and programmes
Takes place at end of decision-making cycle.	Takes place at earlier stages of decision-making cycle.
Reactive approach to development proposal.	Pro-active approach to development proposals.
Identifies specific impacts on the environment.	Identifies environmental implications, issues of sustainable development.
Considers limited number of feasible alternatives.	Considers broad range of potential alternatives.
Limited review of cumulative effects.	Early warning of cumulative effects.
Emphasis on mitigating and minimizing impacts.	Emphasis on meeting environmental objectives and maintaining natural systems.
Narrow perspective, high level of detail.	Broad perspective, lower level of detail to provide a vision and overall framework.
Well-defined process, clear beginning and end.	Multi-stage process, overlapping components, policy level is continuing, iterative.
Focuses on standard agenda, treats symptoms of environmental deterioration.	Focuses on sustainability agenda, gets at sources of environmental deterioration.

Despite taking different forms, SEA systems have a common purpose: to take account of environmental concerns in policy and planning decision making, thereby contributing to sustainable development. However, there are varying interpretations of the role, scope and process of SEA; for example with regard to substantive aims, contribution to environmental protection and sustainable development, inclusion of economic and social factors, and minimum legal and procedural requirements.

1.1 Rationale and aims of SEA

Generally, the premise of SEA can simply be stated: EIA on its own is not enough. Only a relatively small proportion of the proposals and decisions made by governments are subject to examination. SEA rounds out and scales up the coverage from projects to include policy, plans, programmes and other proposed strategic actions with potentially important environmental effects. This process gets at the *sources* of environmental impacts, rather than treating only the *symptoms* in relation to specific projects, see Table 1. By doing so, SEA responds to what the Brundtland commission called 'the chief institutional challenge of the 1990s'. From this perspective, SEA facilitates informed and integrated decision making through the provision of environmental information at the same time and on par with social and economic aspects. The introduction of SEA has been driven by both procedural and substantive trends and imperatives with the aims and objectives (modified from Sadler and Brook, 1998):

- i. To support informed and integrated decision making by:
 - Identifying environmental effects of proposed actions;
 - Considering alternatives, including the best practicable environmental option;
 - Specifying appropriate mitigation measures;
- ii. To contribute to environmentally sound and sustainable development by:
 - Anticipating and preventing environmental impacts at source;
 - Early warning of cumulative effects and global risks;
 - Establishing safeguards based on principles of sustainable development;
- iii. To reinforce project EIA by:
 - Prior identification of scope of potential impacts and information needs;
 - Addressing strategic issues and considerations related to justification of proposals; and
 - Reducing the time and effort necessary to conduct individual review.

Despite its wide use and acceptance, project EIA has acknowledged shortcomings as a tool for minimizing environmental effects of development proposals. It takes place relatively late at the downstream end of the decision-making process, after major alternatives and directions have been chosen. Normally at this stage, the issues have narrowed to how a project should be implemented environmentally, rather than whether, where and what form of development is environmentally appropriate. By addressing these issues upstream in the decision-making process, SEA can help to focus and streamline EIA of any subsequent projects.

More optimally, SEA is a proactive tool to anticipate and prevent environmental damage caused by sector policies and plans enacted by development agencies. A key objective is to provide early warning of large scale and cumulative effects, including those resulting from many smaller scale actions that otherwise would fall under thresholds of triggering a project EIA. For example, a SEA of a land use plan can take account of biodiversity losses associated with proposed developments, or a SEA of a national road building programme can address the implications for climate warming of increased CO₂ emissions in light of commitments under the Paris Agreement and against other transport alternatives.

Other potential policy and institutional benefits can be gained from the use of SEA i.e.:

- Mainstreaming environmental objectives;
- Incorporating sustainability principles into policy making;
- Meeting obligations under international environmental agreements;
- ‘Sustainability assurance’ for development proposals and options;
- Instituting environmental accountability in sector specific agencies; and
- Greater transparency and openness in decision making.

These benefits derive from but extend beyond the gains that occur when the main aims of SEA are achieved. They centre on changes to the culture of decision making that are thought to accompany what the World Bank refers to as ‘mainstreaming’ the environment, i.e. making it part of the mandate and operation of economic agencies. Such changes are expected to be long term and gradual, but some could be instituted sooner (e.g. meeting obligations of a country under the conventions on biodiversity and climate warming).

1.2 Background, evolution and current status of SEA

SEA trends and developments can be placed in the broader context of EIA history. In broad outline, the path of SEA development can be divided into two main phases with a third one imminent. These have been called:

- The formative stage – from 1970 to 1989;
- The formalization stage – from 1990 to 2000; and
- The extension stage – 2001 onward.

During the *formative stage*, certain legal and policy precedents for SEA were established by the introduction and early implementation of EIA. The US *National Environmental Policy Act* (NEPA, 1969) was intended to apply to ‘legislation and other major actions’. For much of this period, however, its scope of application beyond the project level was limited, primarily focused on programmes. In a few other countries, elements of SEA were recognizable in certain EIA processes, for example public inquiries and reviews conducted in Australia and Canada. By the end of the 1980s, other countries and international organisations had begun to make some provision for SEA.

During the *formalisation stage*, SEA systems were established by an increasing number of countries in response to Agenda 21 and other policy statements on sustainable development. These systems were and still are relatively diversified. Some countries made provision for SEA of policy, plans and

programmes separately from EIA legislation and procedure (e.g. Canada and Denmark). Other countries have introduced SEA requirements through environmental appraisal (e.g. UK), in reforms to EIA legislation (e.g. Czech Republic, Slovakia) or as part of resource management of biodiversity conservation regimes (e.g. New Zealand, Australia). Certain lending and development programmes financed by the World Bank became subject to sectoral and regional environmental assessment (EA). As at 1993, no country had EIA legislation in Africa, this meant that the SEA practice had not started. However, by 1997, more than 40% countries had mandatory EIA procedures for development activities.

An *extension stage* is set to begin, marked by the widespread adoption and further consolidation of SEA. Key driving forces were the transposition of the European Directive on SEA by member states (entered into force in 2004) and later by accession countries; and the negotiation of a SEA protocol to the UNECE Convention on Transboundary EIA by signatory countries. These and other international legal and policy developments indicate a tripling of the number of countries that make provision for SEA in the next decade.

2. SCOPE OF APPLICATION OF SEA TO DIFFERENT LEVELS OF DECISION-MAKING INCLUDING POLICY, PLANS AND PROGRAMMES

In principle, SEA can apply to a wide range of proposed actions above the project level. The scope of SEA application and relationship to different levels and types of development decision making is shown in Figure 1.

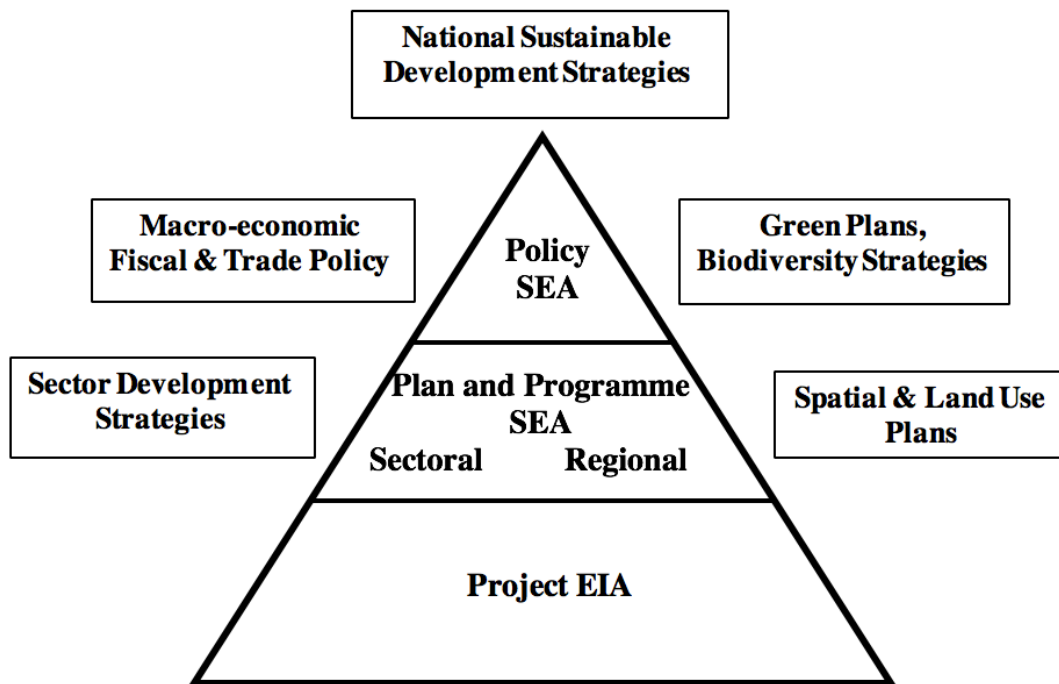


FIGURE 1: SEA in relationship to other decision-making processes

Figure 1 illustrates SEA as a multi-stage process that encompasses policy, plans and programmes (and in certain jurisdictions, legislative bills and other instruments). The definition of the SEA scope (policy, plans and programmes) varies between countries; i.e. the scope of SEA will be defined by what is understood to be a policy, plan or programme within a particular jurisdiction. A generic definition is provided:

- Policy – Guiding intent, defined goals, objectives and priorities, actual or proposed direction;
- Plan – Strategy or design to carry out a general or particular course of action, incorporating policy ends, options and ways and means to implement them; and
- Programme – Schedule of proposed commitments, activities or instruments to be implemented within or by a particular sector or area of policy.

Practically, these terms may overlap and mean different things in different countries, especially with plans and programmes, which are used interchangeably in many jurisdictions. Nonetheless, the meaning of these terms only need to be understood generically, the important point is to apply SEA to what is defined or normally considered to be a policy, plan or programme.

An indicative list of areas subject to SEA may include (modified from Partidário, 2001):

- Sector specific policy, plans and programmes, e.g. the energy sector;
- Spatial and land use plans;
- Regional development programmes;
- Natural resource management strategies;
- Legislative and regulatory bills;
- Investment and lending activities;
- International aid and development assistance;
- Structural adjustment funds and operations;
- Macro-economic policy;
- Budgets and fiscal plans; and
- International trade agreements.

Most attention is given to proposed actions in specific sectors that are known or likely to have significant environmental effects, e.g. energy, transport and industrial development. Other areas commonly subject to SEA include spatial plans, regional development programmes and resource management strategies. As a rule of thumb, candidate SEA areas include strategic proposals that concern or affect land use and natural resources, extraction of raw materials, production of chemicals and other hazardous products and or the generation of pollutants, wastes and residuals etc.

In practise, the scope of application of SEA is incomplete and highly variables, both across jurisdictions and in relation to areas and processes of decision making. So far, few if any countries or international organisations have a comprehensive SEA system in place, one that applies to all strategic actions likely to have significant environmental effects. Most commonly, SEA is applied at the level of development plans and programmes. Policy level applications are less common, but arguably even more important for leveraging a change in direction toward environmental protection and sustainable development.

In context, policies are understood to stand at the apex of a decision making hierarchy, and guide or set a framework for plans and programmes (Figure 1). An integrated framework may be represented as a logical sequence of proposed actions and linkages. Policies lead to plans and programmes, both sectoral and spatial (e.g. land use plans), some of which, in turn, initiate and fix the location of specific projects and activities. Where this arrangement is in place, it permits a tiered approach to SEA and EIA, in which each stage sets up the next as part of a rolling review of policy, plan and project development.

In several countries, however, this idealised framework may be absent, fragmentary or approximated only partially. More likely, many aspects of policy, plan and programme development will be incremental rather than systematic. How this process operates needs to be understood in order to apply SEA successfully in any given country. In turn, policy, plan and programme development will reflect the prevailing 'political culture', the rules and norms by which decisions are made.

In cases where SEA is not yet in place or is incomplete, a country may introduce SEA independently or in response to the requirements of multilateral financial institutions. In either case, 'mapping' the types and processes of decision making in sectors known to have environmental effects can be instructive. Figure 1 is a clear outline of how SEA might be linked and adapted to the prevailing structure of decision making or its extended role.

2.1 Principles and elements for SEA good practise

SEA is practiced under a diverse set of arrangements and decision making contexts. There is no unique model of or best approach to SEA. Instead, a number of general principles of SEA good practice have been drafted, which apply to and underpin the different forms of SEA. The guidelines for SEA good practice have been developed through the international study of Environmental Audits effectiveness, and have been subject to further review by SEA administrators and practitioners at international workshops.

A hierarchy of principles can be identified, based upon the EIA core values and principles. The basic principles for effective EIA issued by the International Association for Impact Assessment (IAIA) are understood to apply SEA, but require further elaboration to take account of their differences. The guiding principles for SEA process design and implementation are described (Sadler and Verheem, 1996; Sadler and Brook, 1998):

- Fit for purpose – the SEA process should be customised to the context and characteristics of policy and plan making.
- Objectives led – the SEA process should be undertaken with reference to environmental goals and principles.
- Sustainability-driven – the SEA process should identify how development options and proposals contribute toward environmentally sound sustainable development.
- Comprehensive scope – the SEA process should cover all levels and types of decision making likely to have significant environmental and health effects.
- Decision relevant – the SEA process should focus on the issues and information that matter in decision making.
- Integrated – the SEA process should include consideration of social, health and other effects as appropriate and necessary (e.g. if equivalent processes are absent).
- Transparent – the SEA process should clear, easily understood requirements and procedures.
- Participative – the SEA process should provide for an appropriate level of public information and involvement.
- Accountable – the SEA process should be carried out fairly, impartially and professionally having regard to the requirements in force and internationally accepted standards, and subject to independent oversight and review.
- Cost effective – the SEA process should achieve its objectives within limits of available policy, information, time and resources.

Enabling conditions for meeting these guiding principles are established through appropriate institutional arrangements including:

- Clear, legal or administrative/policy mandate;
- Explicit scope of application to decision making;
- Requirements and responsibilities for compliance;
- Guidance on procedure and process to be followed;
- Provision for administrative oversight; and
- Mechanisms for quality control, including review of SEA implementation and outcomes.

When introducing or strengthening these arrangements, a number of factors can contribute to their successful implementation, with some reality checks made based on lessons from international experience, i.e.:

- Promote SEA as a bonus and not a burden;
- Encourage creativity and innovation;
- Tailor the approach to the requirements of decision makers;
- Provide start up help and assistance whenever possible;
- Build a knowledge base through 'hands on experience'; and
- Learn by doing when applying new methods and procedures.

Further guidance on applying the SEA guiding principles is provided by operational rules of thumb for SEA good practise and includes:

- Begin as early as practicable in the process of policy or plan formulation;
- Keep in mind that the purpose of SEA is to inform decisions not to produce a study;
- Provide the right information at the right time for decision making;
- Focus on the comparison of major alternatives;
- Carry out an appropriate form of analysis – impact assessment or policy appraisal;
- Use the simplest procedure and methods consistent with the task;
- Look to gain environmental benefits as well avoid adverse impacts; and
- Review and document outcomes of the SEA process.

3. INSTITUTIONAL ARRANGEMENTS, PROCEDURES AND METHODS FOR CARRYING OUT SEA

3.1 Institutional arrangements

A number of countries and international organisations have made formal provision for some type of SEA or a near equivalent process. The legal and administrative arrangements for SEA vary in mandate, scope, elements of procedure and relationship to decision making. As different countries are at varying levels of SEA institutionalisation and implementation, key points stand out in country comparisons:

- i. The formal provision for SEA is made through both law and policy.
The EIA legislation mandates the SEA process in some countries. Where separate provision is made for SEA, it is usually through administrative order or policy directive. A few countries have more than one type of provision for SEA and or have integrated the process within a resource management, land use or development planning system.
- ii. There is limited coverage of policy proposals and draft legislation.
Policy level SEA systems apply to high level processes of decision making (e.g. submissions to Cabinet and Parliament). In some countries, they are characterised by minimal procedure and flexible implementation. In others, EIA based legislation applies specifically or implicitly to policy (although it is not always implemented).
- iii. Plan and programme level SEA systems are based mainly on or correspond to EIA provision and procedure.
The areas and sectors subject to review may be defined generally or listed specifically (e.g. plans and programmes that initiate or fix the type and location of specific projects). Appraisal based systems are closely related but applied as an integral, iterative part of the plan making process, rather than as a separate, formalised procedure.

- iv. SEA arrangements are diversified, far more than those in place for EIA. Several types of SEA systems may be recognised in the institutional frameworks. These define a range of options for consideration by countries that currently have no formal provision for SEA but are moving in that direction or intend to strengthen existing SEA process elements.

There are different types of institutional models of SEA systems:

- EIA based: SEA are carried out under EIA legislation (e.g. Netherlands) or as separately administered but related to procedure (e.g. Canada).
- Environmental appraisal: SEA provision is made through a comparable, less formalised process of policy and plan appraisal (e.g. UK).
- Dual-track system: SEA arrangements are differentiated and implemented as separate processes (e.g. Netherlands' environmental test (or appraisal) of legislation and SEA of specified plans and programmes).
- Integrated policy and planning system: SEA elements are part of effects-based policy and plan-making (e.g. New Zealand).
- Sustainability appraisal: SEA elements are replaced by integrated (environmental, economic and social) assessment and review of major policy and planning issues (e.g. Australia).

The institutional arrangements described above incorporate a number of different forms of SEA. The generic forms of SEA of policies, plans and or programmes include (adapted from Goodland (1998), Kjørven et al., (1993), and Hassan et al. (1996)):

Policy SEA – That entails a review of proposed government actions and options at the broadest level. Policy proposals whether stated or enacted in law are the most critical point of entry for SEA to influence the course of development. This SEA includes potentially wide range of decisions in the form of guidelines, statements, positions papers, legislation and strategies relating to specific sectors (e.g. national energy policy) or applying government wide (e.g. privatisation, trade liberalisation) and can be extended to audit or reassessment of long established policies that have adverse environmental effects (e.g. agricultural subsidies). However law and policy development is traditionally given little or no external scrutiny and SEA has proven difficult to apply at the highest level. This tradition is deeply rooted in the structure of political power and often reinforced by constitutional conventions, such as cabinet secrecy. Political will or acceptance is a pre-requisite for the application of policy level SEA.

Sector plan and programme SEA – This SEA incorporates a review of a development or investment programme for a particular sector (e.g. energy, transport or agriculture) and includes evaluation and comparison of the environmental effects of major alternatives (e.g. demand versus supply measures and mix of fuel sources for power generation). This SEA can be extended to any series of projects that, when grouped together (e.g. by stage of technology) can have potential cumulative effects. Typically, this type of SEA is prepared for plans and programmes that finance a number of sub-projects. It has been applied to the road, water, power, agriculture and urban development sectors in all major regions of the World Bank operations. Some borrowing countries have carried out SEA for a number of Bank financed programmes (e.g. India and Kenya) but it has been little used in other regions (mostly Sub-Saharan Africa).

Spatial plan and regional SEA – This SEA is a review of multi-sector development or investment programme for a particular region (e.g. river basin, coastal zone or urban area) or a land use plan for an officially designated area. It includes evaluation and comparison of the environmental effects of alternative strategies and measures for plan implementation and can be extended to regional or ecosystem assessment of cumulative effects on resource potentials, biodiversity or other aspects of natural capital stock.

3.2 Procedures and methods

In the last decade, considerable experience with SEA practice has been gained in different countries. In many cases, *the procedure and methods used in SEA are the same as in EIA*. Notable examples include plans and programmes that have a direct relationship to projects or land use change. However, EIA based procedures and methods still may need to be modified to take account of greater uncertainty about potential effects, compared to project-specific proposals. For broader policies that have environmental effects that are indirect or attenuated, less formal, more flexible appraisal procedure and methods can be appropriate; these include the screening/scoping phase, analysis/documentation phase and review/submission phase (Verheem and Tonk, 2000).

EIA and appraisal based SEA processes are overlapping and include common procedural elements. The conduct of an EIA-based SEA (also called Strategic Environmental Impact Assessment, SEIA) can include some or all of the following steps (UNECE, 1992):

- Screening – to determine whether or not a SEIA is needed or not and at what levels.
- Scoping – to identify key issues and alternatives, clarify objectives and develop terms of reference for SEA.
- Identification and comparison of alternatives including no action – to clarify implications and trade-offs.
- Inform and involve the public – to identify the views and concerns held by stakeholders.
- Analyse and evaluate the impacts – to identify the significant effects of selected alternatives and measures for mitigation and follow-up.
- Document the findings – to provide the information that is needed for decision making and or to comply with legal requirements.
- Review the quality of the information – to ensure that it is clear, sufficient and relevant to the decision being taken.
- Carry out follow-up measures as necessary – to monitor effects, check on implementation and track any arrangements for subsidiary SEA or EIA.

While carrying out a strategic environmental appraisal includes the following steps:

- List the objectives of the proposal – what does it aim to achieve?
- Describe the alternatives – what are the options that can achieve the objectives?
- Identify environmental impacts, issues and implications – what are the effects, how can they be mitigated?
- Assess their significance – how important are they?
- Quantify costs and benefits – how can this be done?
- Value costs and benefits – which method(s) can be used?
- State the preferred option – what are the reasons?
- Monitor and evaluate the results – what arrangements are in place?

Generally, the tools used in SEA tend to be relatively simple and easy to apply (e.g. checklists and matrices) although more advanced predictive methods can be employed on special circumstances (e.g. air quality simulation models of geothermal development projects) and multi criteria analysis can assist in clarifying the trade offs and comparisons among alternatives. The following principles of good practise should be applied for a systematic analysis:

- Rigour – SEA should apply the ‘best practicable’ methodologies to address the impacts and issues being investigated.
- Practicality – SEA should identify measures for impact mitigation that work best at this level.
- Credibility – SEA should be carried out with professionalism, objectivity, impartiality and balance.

Examples of SEA methods and their usage in the SEA procedure have been summarised into four steps (Table 2):

TABLE 2: Examples of methods and their usage in SEA (Sadler and Verheem, 1996)

Step	Examples of methods
Baseline study	<ul style="list-style-type: none"> • State of environment reporting and similar documentation. • Inventory of environmental stock/setting. • Points of reference for comparable studies.
Screening/Scoping	<ul style="list-style-type: none"> • Formal/informal checklists. • Survey, case comparison. • Effects networks. • Public or expert consultation.
Formulating options	<ul style="list-style-type: none"> • Environmental policy, standards, strategies. • Prior commitments/precedents. • Regional/local plans. • Public values and preferences.
Impact analysis	<ul style="list-style-type: none"> • Scenario development. • Risk assessment. • Environmental indicators and criteria. • Policy impact matrix. • Predictive and simulation models. • GIS, capacity/habitat analysis. • Benefit/cost analysis and other economic valuation techniques. • Multi-criteria analysis.
Documentation for decision making	<ul style="list-style-type: none"> • Cross impact matrices. • Consistency analysis. • Sensitivity analysis. • Decision trees.

3.3 Reporting

Typical contents of a SEA report may vary between countries but will mainly include (Government of Kenya, 2017):

- i. The title of the report;
- ii. A succinct non-technical summary briefly describing the study and its outcomes;
- iii. Introduction on the scope and methodology of work;
- iv. Description of the proposed Policy, Plan or Programme focusing on:
 - (a) The objective, purpose and rationale;
 - (b) Alternative options and strategies;
 - (c) Areas and sectors affected;
 - (d) Proposed activities for Policy, Plan or Programme; and
 - (e) Implementation plan and timescale;
- v. Environmental analysis including:
 - (a) Baseline environmental conditions;
 - (b) Legislative framework;
 - (c) Public or stakeholder engagement activities undertaken;
 - (d) Prediction and evaluation of impacts, including cumulative effects;
 - (e) Alternative options and justification of preferred alternatives; and

- (f) Linkages between ongoing projects and proposed Policy, Plan or Programme;
- vi. Recommendations including but not limited to changes to proposed Policy, Plan or Programme, mitigation measures and alternatives;
- vii. Integration of climate change vulnerability assessment, adaptation and mitigation actions;
- viii. Relevant appendices such as attendance register and minutes of stakeholders' meetings and topographical maps; and
- ix. Environmental management and monitoring plan outlining the measures and actions to be taken during Policy, Plan or Programme implementation.

3.4 Public participation

Public participation is critical in the entire SEA process. The Policy Plan or Programme owner should engage relevant county government(s), lead agencies, key stakeholders and members of public/community during the entire SEA process and strategic stakeholder communication, engagement and grievances plans developed for implementation.

4. FUTURE DIRECTIONS

4.1 Future directions for SEA development: A tool for assessing the sustainability of proposals

There is an increasing discussion of the use of SEA as an instrument to review the sustainability of development proposals, rather than merely to minimize the impact of policy, plan and programme decision. Although this aspect is reflected in the aims and principles of SEA, it is not always evident in practice. In many cases, there is token reference to sustainability, rather than serious consideration of whether proposals are leading toward or away from this goal. This concern reflects both the difficulties encountered in defining sustainability and the fluid state of SEA process development.

Looking ahead, future directions for SEA as a sustainability instrument can follow two routes: one leading towards refocusing SEA as a process for environmental sustainability assurance of policy and plan making, checking that proposed actions are consistent with key measures and safeguards, and two repositioning SEA as a stepping stone or transitional process that leads toward 'sustainability appraisal' or integrated assessment of environmental, economic and social effects of policy, plan and programme proposals. An illustration of using SEA to test for sustainability assurance is provided in Table 3.

TABLE 3: Using SEA to test for sustainability assurance (Sadler, 1999)

Stage of SEA	Sustainability test	Key questions
Screening	Direction toward requirements	Is the proposal consistent with sustainability policies? What are the environmental implications in this regard?
Scoping	Distance to target	How does the proposal measure up against key indicators? What are the significant environmental issues in this regard?
Significance	Determination of significance	What are the environmental impacts of the proposal? How significant are they with reference to sustainability policies and criteria?

Eventually, it is likely that both directions will converge. What is not yet clear is the time frame by which countries can realistically achieve an integrated approach. Some schools of thought prefer to press toward sustainability appraisal. Others argue that a separate SEA process will be needed for the foreseeable future to ensure environmental considerations are fully represented in the decision-making mainstream. This debate will differ in given countries, bearing in mind that many have yet to introduce SEA systems or elements in any form.

5. CASE STUDY: APPLICATION OF SEA FOR A GEOTHERMAL ENERGY PROGRAMME

5.1 Summary of the Strategic Environmental Assessment for the Olkaria Geothermal Field Development Programme

The Kenya Electricity Generating Company PLC (KenGen), is among the leading energy producers in Kenya utilising a mix of different energy sources for power generation. KenGen produces about 75% of electricity installed in Kenya. Among the energy mix, the company has generated 533.8 MWe geothermal power at the Olkaria geothermal power project located at approximately 120 km North-West of Nairobi, the capital city of Kenya (Figure 2).

In its expansion programme, the company has an objective of increasing the Company's installed capacity to over 3000 MWe by the year 2020. Part of the programme includes expansion of the Olkaria geothermal project in various programmes with the aim of increasing geothermal power production capacity to over 1110 MWe by the year 2020; the programme includes installation of additional conventional power plants, wellhead power plants, drilling of geothermal wells, direct uses of geothermal energy, establishment of an industrial park, staff offices and laboratories.

The Olkaria geothermal project is located at a sensitive area and thereby development of the geothermal resource would need to comply to the policies and strategic plans to ensure sustainable development. A SEA study (Barasa, 2016) was undertaken based on the Kenya 2012 SEA guidelines, International Best practise and the requirements of the International Financial Institutions (World Bank, African Development Bank, KfW German Development Bank, European Investment Bank and the Japan International Cooperation Agency). The methodology focused on three requirement areas covering environmental and social aspects:

- i. Policies, Plans, Programmes (PPPs) and Strategies of the Government of Kenya and of the key stakeholders, and how these affect the proposed Programme. More than 50 PPPs and Strategies were analysed. This analysis demonstrated that the relevant PPPs and Strategies work towards Vision 2030, and that the most relevant aspects in relation to KenGen's activities are 'energy generation as a key enabler for economic development and poverty reduction', and 'the protection of biodiversity'. Biodiversity is an asset on its own right and is a key resource for tourism in Kenya.
- ii. The input of the more than 1000 stakeholders which was gathered through a fully inclusive and transparent Stakeholder Engagement Programme (SEP). The SEP aimed to ensure that all stakeholders were informed of the SEA process, that their concerns were incorporated into the analysis and that they had the opportunity to suggest mitigation measures to address the key impacts. The primary concerns of the stakeholders were found to be biodiversity conservation, the protection of Hell's Gate National Park, employment for local communities and issues with KenGen's CSR interventions.
- iii. Analysis of environmental, social and engineering data provided by KenGen. The most relevant issue identified was the lack of a Strategic Environmental and Social Management System

(SESMS) for Olkaria to bring together all environmental and social data and management actions. As a result of this shortcoming, some essential tools and procedures that are critical for the effective management of environmental and social issues during the implementation of the Programme were not in place. These include the lack of a Strategic Stakeholder Coordination Committee for the geothermal area, the lack of a single follow up system for non-conformances identified through different auditing mechanisms, and the lack of a coordinated grievance handling procedure. The results of the validation surveys showed that some monitoring programmes also needed to be changed

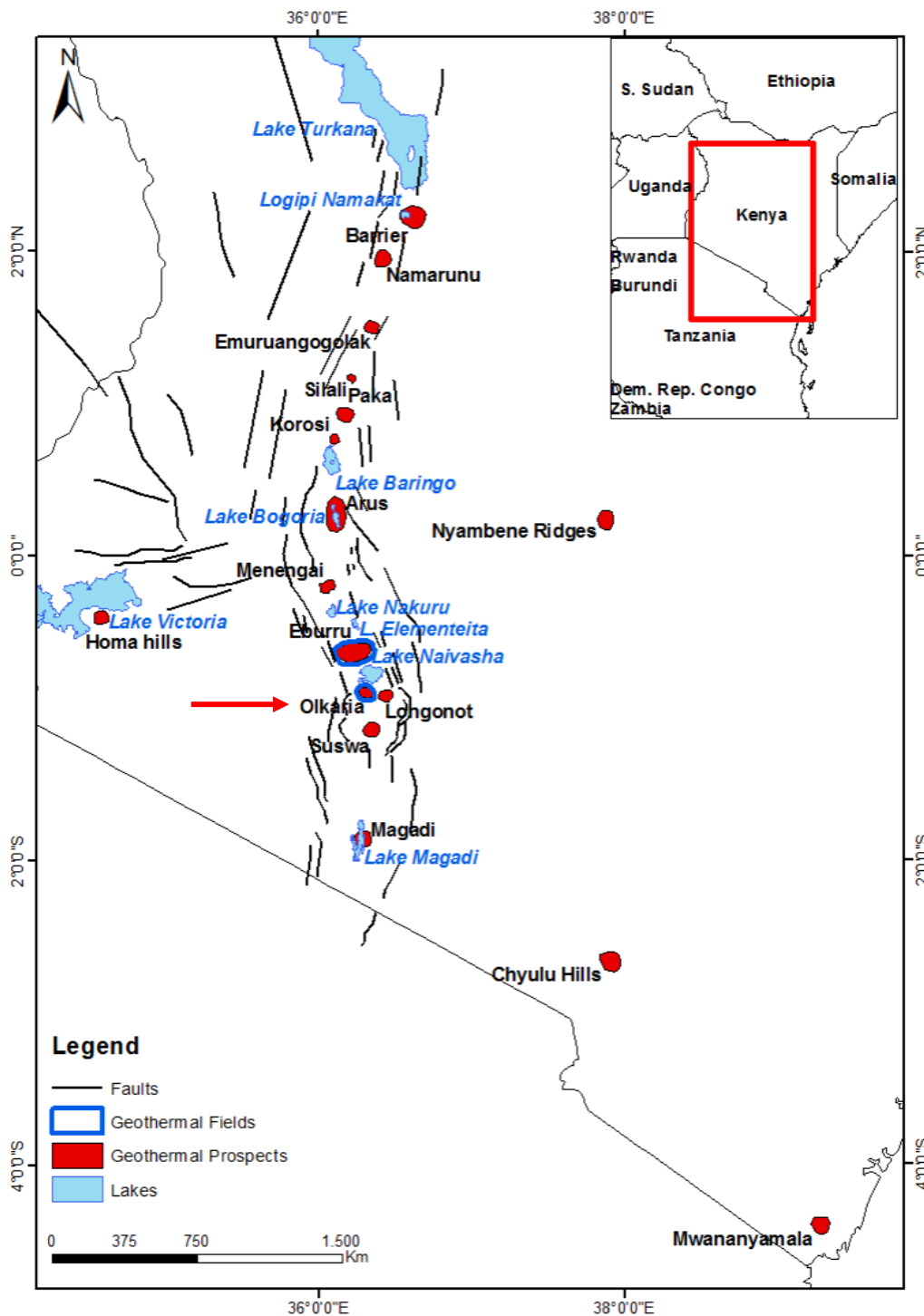


FIGURE 2: Location of geothermal areas in Kenya (Mutia, 2016). The red arrow points at the Olkaria geothermal project.

Key recommendations to issues raised above and status of implementation are provided in Barasa (2016) and summarised in Table 4 below.

TABLE 4: Status of SEA implementation by KenGen (Barasa, 2016)

SEA recommendations	Status of implementation by KenGen and KWS
Protection of wildlife dispersal areas.	<ul style="list-style-type: none"> • KenGen and KWS are undertaking a joint study to review the Hell's Gate – Mt. Longonot Ecosystem Management Plan 2010-2015. The study will identify and map out all wildlife dispersal areas and sensitive receptors. The study is being financed by the two organizations. • KenGen has purchased land adjoining Hell's Gate and Mt. Longonot national parks. The land will not be enclosed as is the case for neighbouring flower farms, instead it would be left open to facilitate wildlife dispersal.
Protection of landuse zones within the park.	<ul style="list-style-type: none"> • Whenever there is need to carry out geothermal development within the high use geothermal licensed area, KenGen and KWS carry out a joint visit to the site that informs whether the development will proceed or not depending with the sensitivity of the site. In case the development is permitted, Environmental Impact Assessments (EIA) must be conducted and the Environmental Management Plan implemented to the later. • There exists KenGen-KWS memorandum of understanding. • KWS have deployed a Research Scientist at Hell's Gate National Park to work hand in hand with KenGen's environmental scientists. • The land that KenGen has bought will be used for future geothermal development thus facilitating step out from the high use geothermal licensed area.
Restoration of disturbed sites.	<ul style="list-style-type: none"> • KenGen has procured the services of a contractor who is currently undertaking landscaping and rehabilitation of disturbed sites and fencing of brine ponds.
Minimization of project footprint.	<ul style="list-style-type: none"> • KenGen is currently drilling multiple wells on the same well pad. Use of directional drilling technology permits drilling of two to six wells on the same well pad thus minimizing the project footprint. • In August 2015, staff offices were relocated from Hell's Gate National Park to the staff quarters approximately 10 km away. This has contributed towards minimization of vehicular and human traffic within the park. About 300 vehicles on average used to enter the park on a daily basis when staff offices were still within park.
Minimization of quantities of water abstracted from Lake Naivasha.	<ul style="list-style-type: none"> • KenGen is carrying out drilling of geothermal wells using brine. This has helped to supplement the water abstracted from Lake Naivasha. • Hydrogeological studies have been undertaken to establish feasibility of drilling boreholes at Olkaria geothermal field.
Sound management of effluent.	<ul style="list-style-type: none"> • KenGen is undertaking rehabilitation/upgrading of Olkaria I power plant to incorporate a reinjection system, thereby minimizing the negative impact on the environment. • Shallow reinjection wells have been incorporated in the design of the wellhead power plants.
Noise emission minimization.	<ul style="list-style-type: none"> • The company has procured a prototype improved silencer that is currently undergoing test ready for adoption during well discharge tests. • The company has entered into collaboration with research institutions to explore other possible ways of minimizing noise emissions.

In summary, the SEA demonstrates that the full implementation of the Olkaria geothermal expansion Programme (over 1110 MWe by 2020) is feasible subject to progressively increasing mitigation measures and that sustainable geothermal development can be achieved in Olkaria.

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