



## Review

## Review of the environmental oversight framework in Kenya, in light of a nuclear power programme



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## ABSTRACT

By means of an Environmental Impact Assessment (EIA), environmental impacts associated with Nuclear Power Plants (NPPs) can be identified and evaluated. International approaches and guidelines indicate that nuclear newcomer countries such as Kenya need to ensure that the national legal and regulatory framework for environmental protection accounts for the unique safety and environmental aspects of such an endeavor. In particular, existing laws may require amendment and/or supplement. Moreover, the responsibilities of the environmental agency and nuclear regulatory body, in environmental oversight of NPPs will need to be legally defined in order to prevent overlapping of responsibilities and to minimize the potential for project delay. Case histories of countries with advanced nuclear power programmes were performed to identify strategies which align with best environmental management practices, as relevant to newcomer countries such as Kenya. A review of the environmental assessment framework for United States and Canada indicates similar approaches whereby the nuclear regulatory body has the sole responsibility in EIA. However, in Sweden, NPPs are required to receive authorisation from the Radiation Safety Authority as well as from an environmental court. Kenya has an existing environmental protection framework, and as a standard requirement, a nuclear regulatory body will be designated to regulate NPPs in order to ensure protection of people and the environment. In light of a nuclear power programme, a review of the national legal framework in Kenya should be done in order to ascertain if amendment and/or supplement of the environmental law and supporting regulations is required. Moreover, in order to ensure effective environmental regulation of NPPs, the responsibilities of the environmental agency and nuclear regulatory body need to be legally defined in order to prevent overlapping of responsibilities. This paper also suggests two alternative structures for the EIA process and authorisation for NPPs in Kenya.

## 1. Introduction

“Sustainable development” has been a global and national focus over the past four decades. A 1987 United Nations report, describes sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987). Commensurate with this goal, programmes and projects should be implemented and executed with consideration of environmental protection.

The concept of sustainable development includes the economic, environmental, and social aspects of the programme or project. According to the International Atomic Energy Agency (IAEA), in the environmental pillar, the sustainability issues of nuclear energy include climate change, impacts on ecosystems, waste generation, and impacts on water and land use (International Atomic Energy Agency (IAEA), 2016). In terms of climate change, nuclear energy is viewed as playing a key role in mitigating greenhouse gas emissions. The Intergovernmental

Panel on Climate Change (IPCC) states that: “the life cycle greenhouse gas emissions per kWh from nuclear power plants are two orders of magnitude lower than those of fossil-fueled electricity generation and comparable to most renewables. Hence it is an effective GHG mitigation option, especially by way of investments in the lifetime extension of existing plants” (Intergovernmental Panel on Climate Change (IPCC), 2001).

However, the impacts on ecosystems, land and water use, and waste generation remain a key challenge for nuclear energy requiring careful assessment of the environmental stresses associated with proposed projects. Such issues are recognized with concerns that construction and operation of Nuclear Power Plants (NPPs) must be investigated to reduce, minimize, or eliminate potential impacts. Environmental Impact Assessment (EIA) is crucial in the initial stages of a nuclear power programme. Development of the EIA first requires determination of the criteria and monitoring requirements for the plant lifecycle (i.e., construction, operations, and decommissioning) (Susanto Eko, 2013).

The need for energy sufficiency especially in developing countries

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**Table 1**  
Emerging and prospective nuclear energy countries.

Region	Countries
Europe	Italy, Albania, Serbia, Croatia, Portugal, Norway, Poland, Belarus, Estonia, Latvia, Ireland, Turkey.
Middle East and North Africa	UAE, Saudi Arabia, Qatar, Kuwait, Yemen, Israel, Syria, Jordan, Egypt, Tunisia, Libya, Algeria, Morocco, Sudan.
West, Central and Southern Africa	Nigeria, Ghana, Senegal, Kenya, Uganda, Tanzania, Zambia, Namibia.
Central and South America	Cuba, Chile, Ecuador, Venezuela, Bolivia, Peru, Paraguay
Central and Southern Asia	Azerbaijan, Georgia, Kazakhstan, Mongolia, Bangladesh, Sri Lanka
South East Asia	Indonesia, Philippines, Vietnam, Thailand, Laos, Cambodia, Malaysia, Singapore, Myanmar, Australia, New Zealand.
East Asia	North Korea

has led to widespread consideration of nuclear electricity generation. Table 1 identifies more than fifty (50) countries that have recently expressed an interest in nuclear power development (i.e., as outlined by the World Nuclear Association (WNA)). Table 1 lists these countries, which include front runners such as the United Arab Emirates (UAE), Turkey, Belarus, and Poland (World Nuclear Association (WNA), 2017).

## 2. Background of Kenya nuclear power programme

The Kenya national development plan, termed ‘Vision 2030’ for the period from 2008 to 2030, outlines the long-term policy aims to transform Kenya into a newly industrialized and middle-income country, one which can provide a high quality of life to Kenyan citizens. The outlined strategy includes recommended development projects to address increased national energy demand. In particular it examines diversification of the nation's energy mix (Government of Kenya, 2008).

Nuclear electricity generation has been proposed for inclusion in the national energy mix in a decision based on projected long-term energy demand in Kenya. In order to implement a nuclear power programme, the Kenya Nuclear Electricity Board (KNEB) was established as a government agency within the Ministry of Energy and Petroleum. KNEB serves the role of a Nuclear Energy Programme Implementing Organization (NEPIO) as defined by the IAEA. In order to execute the nuclear energy programme, KNEB has adopted the Milestones Approach recommended by the IAEA whereby there are three (3) phases of development in the nuclear power programme as well as three milestones to achieve. In this approach, nineteen infrastructure areas are recommended which are necessary for successful implementation of a new nuclear power programme (IAEA, 2015). These areas are listed in Table 2.

The IAEA recommends that a newcomer country should develop a comprehensive plan to address the nineteen infrastructure areas in order to support a new nuclear power programme.

As part of implementing the nuclear power programme in Kenya, a prefeasibility study was performed by KNEB. In this study, the government agencies responsible for the nineteen infrastructure areas listed above were involved. This study evaluated the status of development of the areas in Kenya, identified gaps, and recommended strategies for improvement. Additionally, in August 2015, international experts from the nuclear industry conducted the Integrated Nuclear

**Table 2**  
Nineteen infrastructure areas.

IAEA Infrastructure Areas			
1	Nuclear Safety	11	Stakeholder Involvement
2	Funding and Financing	12	Regulatory Framework
3	Radioactive Waste	13	Site and Supporting Facilities
4	National position	14	Industrial Involvement
5	Environmental Protection	15	Electric Grid
6	Radiation Protection	16	Nuclear Fuel Cycle
7	Emergency Planning	17	Procurement
8	Security and Physical Protection	18	Human Resources Development
9	Management	19	Legislative Framework
10	Safeguards		

Infrastructure Review (INIR) mission organized by the IAEA. This review provided a number of expert recommendations for improving each of the infrastructure areas in readiness for a nuclear power programme.

Relevant government agencies involved in the prefeasibility study also participated as correspondents to the INIR mission. These agencies included: The Ministry of Environment, the National Environment Management Authority, the Ministry of Energy, the Radiation Protection Board, the Kenya Electricity Generating Company, the Energy Regulatory Commission, the National Commission for Science Technology and Innovation, amongst others (IAEA).

According to the IAEA Milestone Approach to implementing a nuclear power programme, a newcomer country achieves the first milestone, ‘Milestone One’, upon evaluation of the considerations needed in order to make a knowledgeable decision to introduce nuclear power (IAEA, 2015). The prefeasibility study and the INIR mission in Kenya were the principal Phase I activities whose major outcome was identification of infrastructure areas in need of development to the level of supporting NPP construction and operation. Subsequent activities have revolved around addressing the recommendations from the prefeasibility study and the INIR mission. As a result, Kenya can be termed as being in Phase 2 of nuclear power programme implementation per the IAEA Milestones Approach. This is termed as, ‘Preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken’. In this phase KNEB is collaborating with state and international organisations in activities to enable the country to be technically ready to procure, construct, and operate a nuclear power plant.

In order ensure successful implementation of the nuclear power programme, Kenya continues to cooperate with the IAEA in developing the nineteen infrastructure areas. Additionally, Kenya has entered into formal agreements with countries with advanced nuclear power programmes as a way of enhancing its capabilities. Kenya has collaborated with the Republic of Korea to build capacity building through training of Kenya nationals in the area of nuclear engineering since 2012. Other countries that have entered into formal agreements with Kenya are China and Russia.

## 3. Current environmental protection framework of Kenya

In Kenya, environmental protection is governed by the Environmental Management and Coordination Act (EMCA). The EMCA codifies requirements for protecting various aspects of the environment and also delineates responsibilities for fulfilling these requirements. In addition, environmental regulations and guidelines have been developed. These include: i) Environmental Impact Assessment (EIA) regulations, ii) water quality regulations, iii) air quality regulations, iv) wetland regulations, v) controlled substances regulations, vi) EIA guidelines, and vi) Strategic Environmental Assessments (SEA) guidelines.

In terms of environmental agencies, the National Environment Management Authority (NEMA) is the principal governmental agency responsible for regulating environmental protection. It is established within the Ministry of Environment, Water and Natural Resources. NEMA has a mandate to implement EMCA and to coordinate overall

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