

The Neglected Link: Safeguarding Pollinators for Sustainable Development in Kenya

By: Kariuki Muigua

Abstract

Efforts to achieve sustainable development have never been greater the world over. Most, if not all states and non-governmental organisations, are coming up with multisectoral measures to promote the sustainable development agenda, based on the global framework on sustainable development. Kenya has also not been left behind as there is evidence of various actions and programmes put in place to promote sustainable development in all sectors of the economy. However, one area that is arguably indispensable but has received minimal attention is safeguarding pollinators as important players in the sustainable development agenda.

This paper critically discusses and offers recommendations on ways in which Kenya can ensure that pollinators, which play a critical role in environmental conservation and food and nutritional provision, are safeguarded as important players in the sustainable development debate.

1. Introduction

The prevailing debate on sustainable development the world over mainly revolves around minimizing adverse human impact on the environment as part of maximizing Ecosystem Services. The debate has been about balancing anthropocentric and ecocentric approaches to environmental protection and conservation. However, one area of biological diversity conservation that has received little or no attention, especially under the current Kenyan environment and natural resources laws, is the plant-pollinators' community that plays an indispensable role in natural resources and environmental regeneration for ecosystem Services. Globally, biodiversity loss has been attributed to various factors, including, habitat loss, pest invasion, pollution, over-harvesting and disease.¹ Pollination services are provided both by wild, free-living organisms (mainly bees, but also to name a few, many butterflies, moths and flies), and by commercially managed bee species. Bees are considered the predominant and most

* PhD in Law (Nrb), FCI Arb (Chartered Arbitrator), LL.B (Hons) Nrb, LL.M (Environmental Law) Nrb; Dip. In Law (KSL); FCPS (K); Dip. In Arbitration (UK); MKIM; Mediator; Consultant: Lead expert EIA/EA NEMA; BSI ISO/IEC 27001:2005 ISMS Lead Auditor/ Implementer; Advocate of the High Court of Kenya; Senior Lecturer at the University of Nairobi, School of Law [December, 2017].

¹ Wilcove D.S, Rothstein J, Dubow A, Phillips and Losos E., "Quantifying threats to imperiled species in the United States", *BioScience*, 48, 1998, pp. 607-615 (As quoted in Kluser, S., Neumann, P., Chauzat, M.P., Pettis, J.S., Peduzzi, P., Witt, R., Fernandez, N. and Theuri, M., *Global honey bee colony disorders and other threats to insect pollinators*, (United Nations Environmental Programme, 2010), p.1. Available at https://www.researchgate.net/profile/Peter_Neumann5/publication/305160493_Disorders_of_bee_colonies_around_the_world_and_other_threats_to_insect_pollinators/links/5783b17208ae37d3af6c005c/Disorders-of-bee-colonies-around-the-world-and-other-threats-to-insect-pollinators.pdf [Accessed on 24/11/2017].

economically important group of pollinators in most geographical regions.² Past reports carried in the Kenyan local dailies have highlighted the problem, asserting that Kenyan farmers are driving bees, wasps, butterflies and other pollinators to extinction, consequently threatening food supply.³ Despite this, there is arguably inadequate evidence demonstrating Kenya's commitment to protect these important organisms as part of biodiversity conservation, and ultimately, achieving the right to food security for all, as guaranteed under the Constitution of Kenya 2010⁴. The inadequate or lack of legal responses to pollinators' protection in the Kenyan environmental and natural resources laws has had adverse effect on the pollinators, and arguably, their protection is currently based on a general approach to environmental conservation for provision of ecosystem services. Pollinators are part of the biodiversity and, if any measures geared towards biodiversity conservation are to succeed, they must include pollinators.

This paper seeks to highlight and critically discuss some of the challenges that affect these important players in the sustainable development discourse and also suggest some of the legal and non-legal mechanisms through which they can be addressed.

2. Pollinators as Key Players in Environmental Conservation Discourse: The Neglected Link

Pollinators are important for the provision of ecosystem services. Indeed, it has rightly been pointed out that 'the modern concept of 'ecosystem services' has progressed significantly in recent decades, past its conception as a communication tool in the late 1970s to explain societal dependence on nature, to incorporate economic dimensions and provide help to decision makers for implementing effective conservation policies which support human wellbeing and sustainable development'.⁵ Pollination is vital to the ecosystems and to human societies and the health and wellbeing of pollinating insects is considered as crucial to life, be it in sustaining natural habitats or contributing to local and global economies.⁶

² Kluser, S., Neumann, P., Chauzat, M.P., Pettis, J.S., Peduzzi, P., Witt, R., Fernandez, N. and Theuri, M., *Global honey bee colony disorders and other threats to insect pollinators*, op cit., p. 1.

³ "Bees, butterflies face extinction, threatening Kenya food production," *Business Daily Africa*, Monday, April 18, 2016 16:36. Available at <http://www.businessdailyafrica.com/economy/Bees-butterflies-face-extinction-threatening-Kenya-food/3946234-3164704-xvcgld/index.html> [Accessed on 24/11/2017].

⁴ Constitution of Kenya, 2010, Art. 43:

43. Economic and social rights

(1) Every person has the right –

(c) to be free from hunger, and to have adequate food of acceptable quality;

⁵ Dolf de Groot, 'Protecting natural capital for human wellbeing and sustainable development,' *Science for Environment Policy – A Weekly News Alert*, Special Issue: Ecosystem Services, Issue 20, May 2010, p.1. Available at http://ec.europa.eu/environment/integration/research/newsalert/pdf/20si_en.pdf [Accessed on 24/11/2017].

⁶ Kluser, S., Neumann, P., Chauzat, M.P., Pettis, J.S., Peduzzi, P., Witt, R., Fernandez, N. and Theuri, M., *Global honey bee colony disorders and other threats to insect pollinators*, op cit., p. 2; See also generally, Ollerton, J., Winfree, R. and Tarrant, S., "How many flowering plants are pollinated by animals?" *Oikos*, Vol.120, No., 2011, pp.321-326.

While some plants are capable of self-pollination, the highest percentage of plant pollination is attributed to animal-mediated pollination. Animal-Pollinators have been defined as 'animals that enable reproduction of many species of flowering plants by transferring pollen from one flower to another of the same species'.⁷

Therefore, while there may be several types of pollinators, this paper is mainly concerned with the animal pollinators which include, inter alia, bees, beetles, bees, flies, moths, butterflies, bats and birds, amongst others, in what is commonly referred to as biotic pollination.⁸ Biotic pollination is meant to be a symbiotic process in which both the animal pollinators and the plants benefit in terms of food for the former and pollination process for the latter.⁹ This discourse is thus meant to address the factors and practices that adversely affect this mutual relationship between the two groups.

Considering that 'plants serve as air and water filters, are an indispensable part of the water cycle, prevent erosion of valuable soil re-sources, and give us numerous foods, fibers, and medicines, pollinators are considered as critical to biodiversity, ecosystem services, agricultural productivity, world economies, and human quality of life'.¹⁰ Any threats to these animal-pollinators therefore threaten the whole chain of natural provision of ecosystem services.

3. Protection of Pollinators: the Legal and Policy Framework

Internationally, there are a number of policy and legal instruments on biodiversity conservation that carry provisions geared towards conservation of pollinators. One of the most relevant of these is the 1992 *Convention on Biological Diversity*¹¹ was adopted during the Earth Summit in Rio de Janeiro, with the objective of conservation of biological diversity; the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.¹² While the Convention does not specifically mention pollinators, it accords "Biological diversity" a broad definition to mean 'the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic

⁷ San Luis Obispo County, 'Pollinator Information & Resources', *Ranching Sustainability Analysis Info Sheet*, available at <http://cesanluisobispo.ucdavis.edu/files/136181.pdf> [Accessed on 24/11/2017].

⁸ "Pollination in the Tropics," available at <https://wolfweb.unr.edu/~ldyer/classes/396/plantanimal.pdf> [Accessed on 24/11/2017].

⁹ Ibid.

¹⁰ San Luis Obispo County, 'Pollinator Information & Resources', op cit., p.1.

¹¹ United Nations Environment Programme, *Convention on Biological Diversity*, 1760 UNTS 79; 31 ILM 818 (1992), United Nations, Treaty Series, vol. 1760, p. 79. The Convention was adopted by the Intergovernmental Negotiating Committee for a Convention on Biological Diversity, during its Fifth session, held at Nairobi from 11 to 22 May 1992. Kenya signed the Convention on 11 Jun 1992 and ratified it on 26 Jul 1994.

¹² *Convention on Biological Diversity*, Art. 1.

ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems'.¹³

The Convention also defines "Biological resources" to include genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.¹⁴ Pollinators are thus covered under these broad definitions as part of the biodiversity to be protected and conserved under the Convention. The Convention outlines under Article 6 thereof state obligations on the general measures for conservation and sustainable use of the biological diversity within their territories.¹⁵

The *Agenda 21*¹⁶ also contains provisions under chapter 15 thereof on the conservation of biological diversity. The objectives and activities in chapter 15 of Agenda 21 are intended to improve the conservation of biological diversity and the sustainable use of biological resources, as well as to support the Convention on Biological Diversity.¹⁷ Agenda 21 specifically

¹³ *Convention on Biological Diversity*, Art. 2.

¹⁴ *Convention on Biological Diversity*, Art. 2.

¹⁵ Article 6. General Measures for Conservation and Sustainable Use

Each Contracting Party shall, in accordance with its particular conditions and capabilities:

- (a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
- (b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 7 thereof also requires each Contracting Party to, as far as possible and as appropriate, in particular for the purposes of Articles 8 to 10:

- (a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I:

Annex I provides for monitoring and identification with regard to ecosystems and habitats containing high diversity, large numbers of endemic or threatened species, or wilderness; required by migratory species; of social, economic, cultural or scientific importance: or, which are representative, unique or associated with key evolutionary or other biological processes.

- (b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;
- (c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and
- (d) Maintain and organize, by any mechanism data, derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above.

¹⁶ *Agenda 21* (A/CONF.151/26, vol.II), adopted by the United Nations Conference on Environment and Development on 14 June 1992.

¹⁷ *Agenda 21*, Para. 15.1.

acknowledges that our planet's essential goods and services depend on the variety and variability of genes, species, populations and ecosystems. Biological resources feed and clothe us and provide housing, medicines and spiritual nourishment. The natural ecosystems of forests, savannahs, pastures and rangelands, deserts, tundras, rivers, lakes and seas contain most of the Earth's biodiversity. Farmers' fields and gardens are also of great importance as repositories, while gene banks, botanical gardens, zoos and other germplasm repositories make a small but significant contribution. Chapter 15 also acknowledges that the current decline in biodiversity is largely the result of human activity and represents a serious threat to human development.¹⁸ The highlighted biodiversity also include animal-pollinators, although not specifically mentioned as such.

The *Aichi Biodiversity Target 7* seeks to ensure that, by 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.¹⁹

The technical rationale for the *Aichi Target 7*, according to the Convention on Biological Diversity Secretariat, is that the ecologically unsustainable consumption of water, use and run-off of pesticides and excess fertilizers, and the conversion of natural habitats to uniform monocultures, amongst other factors, have major negative impacts on biodiversity inside and outside of agricultural areas, as well as on forest, inland water and coastal ecosystems.²⁰ The Secretariat supports sustainable management on the basis that it not only contributes to biodiversity conservation but can also deliver benefits to production systems in terms of services such as soil fertility, erosion control, enhanced pollination and reduced pest outbreaks, as well as contributing to the well-being and sustainable livelihoods of local communities engaged in the management of local natural resources.²¹

Party states are thus expected to put in place domestic measures that are geared towards achieving these targets. The Constitution of Kenya 2010 envisages the place of international legal instruments under Article 2 which recognises them as forming part of the laws of Kenya.²² The Constitution also places obligations on the state to, inter alia: ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; work to achieve and maintain a tree cover of at least ten percent of the land area of Kenya; protect and enhance intellectual property in, and

¹⁸ Agenda 21, Para. 15.2.

¹⁹ Aichi Biodiversity Targets - Convention on Biological Diversity (CBD), <https://www.cbd.int/sp/targets/>

²⁰ Convention on Biological Diversity Secretariat, "TARGET 7 - Technical Rationale extended (provided in document COP/10/INF/12/Rev.1)," available at <https://www.cbd.int/sp/targets/rationale/target-7/> [Accessed on 1/01/2018].

²¹ Ibid.

²² Constitution of Kenya, 2010: Article 2(5) "The general rules of international law shall form part of the law of Kenya."

.....(6) "Any treaty or convention ratified by Kenya shall form part of the law of Kenya under this Constitution."

indigenous knowledge of, biodiversity and the genetic resources of the communities; encourage public participation in the management, protection and conservation of the environment; protect genetic resources and biological diversity; establish systems of environmental impact assessment, environmental audit and monitoring of the environment; eliminate processes and activities that are likely to endanger the environment; and utilise the environment and natural resources for the benefit of the people of Kenya.²³

The *Environmental Management and Co-ordination Act 1999*²⁴ (EMCA) calls for conservation of 'biological diversity' which is defined under the Act to mean 'the variability among living organisms from all sources including, terrestrial ecosystems, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species and of ecosystems'.²⁵

In a bid to promote conservation of biological diversity, EMCA provides that the National Environment Management Authority (NEMA) should, in consultation with the relevant lead agencies, prescribe measures necessary to ensure the conservation of biological diversity in Kenya and in this respect the Authority should: identify, prepare and maintain an inventory of biological diversity of Kenya; determine which components of biological diversity are endangered, rare or threatened with extinction; identify potential threats to biological diversity and devise measures to remove or arrest their effects; undertake measures intended to integrate the conservation and sustainable utilisation ethic in relation to biological diversity in existing government activities and activities by private persons; specify national strategies, plans and government programmes for conservation and sustainable use of biological diversity; protect indigenous property rights of local communities in respect of biological diversity; and measure the value of unexploited natural resources in terms of watershed protection, influences on climate, cultural and aesthetic value, as well as actual and potential genetic value thereof.²⁶

Notably, EMCA provides for conservation of biological resources in situ and ex-situ. With regard to conservation in situ, it requires the Authority to, in consultation with the concerned lead agencies, prescribe measures adequate to ensure the conservation of biological resources in situ and should issue guidelines for— land use methods that are compatible with conservation of biological diversity; the selection and management of protected areas so as to promote the conservation of the various terrestrial and aquatic ecosystems under the jurisdiction of Kenya; selection and management of buffer zones near protected areas; special arrangements for the protection of species, ecosystems and habitats threatened with extinction; prohibiting and

²³ Ibid., Article 69(1).

²⁴ *Environmental Management and Co-ordination Act*, Act No. 8 of 1999, Laws of Kenya [Revised Edition 2012 [1999]]; See also the *Environmental Management and Co-ordination (Amendment) Act, 2015* (Amendment Act, No. 5 of 2015, which was enacted to amend the Environmental Management and Co-ordination Act, 1999.

²⁵ Ibid., sec. 2.

²⁶ Ibid., sec. 50.

controlling the introduction of alien species into natural habitats; and integrating traditional knowledge for the conservation of biological diversity with mainstream scientific knowledge.²⁷ With regard to Conservation of biological resources ex-situ, the Authority is required to, in consultation with the relevant lead agencies— prescribe measures for the conservation of biological resources ex-situ especially for those species threatened with extinction; issue guidelines for the management of—(i) germplasm banks; (ii) botanical gardens; (iii) zoos or aquaria; (iv) animal orphanages; and (v) any other facilities recommended to the Authority by any of its Committees or considered necessary by the Authority; ensure that species threatened with extinction which are conserved ex-situ are re-introduced into their native habitats and ecosystems where— (i) the threat to the species has been terminated; or (ii) a viable population of the threatened species has been achieved.²⁸

For purposes of protection of environmentally significant areas, the Cabinet Secretary may, in consultation with the relevant lead agencies, by notice in the Gazette, declare any area of land, sea, lake or river to be a protected natural environment for the purpose of promoting and preserving specific ecological processes, natural environment systems, natural beauty or species of indigenous wildlife or the preservation of biological diversity in general.²⁹

Other provisions in EMCA that are germane to protection of pollinators relate to standards of pesticides and toxic substances, where the Act provides that the Standards and Enforcement Review Committee, in consultation with the relevant lead agencies should— prepare and submit to the Authority draft standards for the concentration of pesticides residues in raw agricultural commodities, for the purposes of this paragraph raw agricultural commodities— (i) include fresh or frozen fruit and vegetables in their raw state, grains, nuts, eggs, raw milk, meat and other agricultural produce; (ii) do not include any agricultural produce or good which is processed, fabricated or manufactured by cooking, dehydrating, milling, or by any other similar means; establish, revisit, modify and submit to the Authority draft standards to regulate the importation, exportation, manufacture, storage, distribution, sale, use, packaging, transportation disposal and advertisement of pesticides and toxic substances with the relevant organisations; establish and submit to the Authority draft procedures for the registration of pesticides and toxic substances; establish and submit to the Authority draft measures to ensure proper labelling and packaging of pesticides and toxic substances; constantly review the use and efficacy of pesticides and toxic substances and submit the findings of such review to the Authority; recommend to the Authority measures for monitoring the effects of pesticides and toxic substances on the environment; recommend to the Authority measures for the establishment and maintenance of laboratories to operate as standards laboratories for pesticides and toxic substances; recommend to the Authority measures for the establishment of enforcement procedures and regulations for the

²⁷ Ibid., sec. 51.

²⁸ *Environmental Management and Co-ordination Act*, 1999, sec. 52.

²⁹ Ibid., sec. 53(1).

storage, packaging and transportation of pesticides and toxic substances; constantly collect data from industries on the production, use and health effects of pesticides and toxic substances and avail such data to the Authority; keep up-to-date records and reports necessary for the proper regulation of the administration of pesticides and toxic substances; do all other things as appear necessary for the monitoring and control of pesticides and toxic substances.³⁰

EMCA further provides that subject to the provisions of this Act or any other written law applicable in Kenya, any person who intends to manufacture, import or process a new pesticide or toxic substance or who intends to reprocess an existing pesticide or toxic substance for a significantly new use, must apply to the Authority for the registration of the pesticide or toxic substance, before importing, manufacturing, processing or reprocessing such pesticides or toxic substance.³¹

Furthermore, the application referred to in subsection (1) should include the name, trademark, and the molecular structure, proposed categories of use, an estimate of the quantity of the pesticides or toxic substances and any data related to health and other environmental effects thereof that the Authority may require.³²

While animal pollinators include many insects and animals, bees seem to be the most popular in Kenya and around the world (perhaps based on the fact that beekeeping has traditionally been practised in the country over a long time for economic as an enterprise), with even attempts having been made to address them while excluding all the others. For instance, Kenya's *National Beekeeping Policy* which was developed by the Ministry of Livestock in 2009 with the overall objective of enhancing the contribution of the beekeeping sector to food security, employment creation and environmental conservation in the country.³³

This leaves all the other beneficial organisms predisposed to elimination through destructive agricultural practices and chemical use.

Kenya's *National Environment Policy 2012* accords the term 'environment' a very broad meaning to 'include the physical factors of the surroundings of human beings including land, water, atmosphere, sound, odour, taste, the biological factors of animals and plants and the social factors of aesthetics, and includes both the natural and the built environment'.³⁴ The *National Environment Policy* rightly points out that 'the main human activities contributing to environmental degradation in Kenya include unsustainable agricultural land use, poor soil and water management practices, deforestation, overgrazing, and pollution'.³⁵ 'These activities

³⁰ *Environmental Management and Co-ordination Act, 1999*, sec. 94.

³¹ *Ibid.*, sec. 94(1).

³² *Ibid.*, sec. 94(2).

³³ Republic of Kenya, *National Beekeeping Policy 2009*, para. 2.2.

³⁴ Republic of Kenya, *National Environment Policy 2012*, (Government printer, 2012, Nairobi), para. 1.1.

³⁵ Republic of Kenya, *National Environment Policy 2012*, (Government printer, 2012, Nairobi), para. 2.1.

contribute a great deal to degradation of the country's natural resources such as land, fresh and marine waters, forests and biodiversity threatens the livelihoods of many people. They undermine the sink function of the environment which operates through such processes as nutrient recycling, decomposition and the natural purification and filtering of air and water.³⁶ Regarding conservation of biodiversity, the *National Environment Policy* provides that 'Kenya is internationally recognized as a mega diverse country in terms of richness in biodiversity. It also recognises that biodiversity contributes to a wide variety of environmental services, such as regulation of the gaseous composition of the atmosphere, protection of coastal zone, regulation of the hydrological cycle and climate, generation and conservation of fertile soils, dispersal and breakdown of wastes, pollination of many crops, and absorption of pollutants. Furthermore, human health and well-being are directly dependent on biodiversity. Biodiversity also provides genetic resources for food and agriculture, and therefore constitutes the biological basis for food security and support for human livelihoods.³⁷

The *National Environment Policy* also highlights the fact that loss of biodiversity is going on at unprecedented rate, with the most important drivers being land degradation, climate change, pollution, unsustainable harvesting of natural resources, unsustainable patterns of consumption and production, and introduction of invasive and alien species.³⁸

To address the highlighted problems, the *Policy* document requires the Government to: Revise and implement the National Biodiversity Strategy and Action Plan (NBSAP); Regulate and encourage sustainable utilization and bioprospecting of biological resources in accordance with international law; Develop mechanisms to ensure that the benefits arising from access to genetic resources, including intellectual property rights, traditional knowledge and technology are shared equitably with communities living in areas where the genetic material originated; and Develop and implement a strategy to contain, control and mitigate alien and invasive species.³⁹ The *Pest Control Products Act*⁴⁰ is meant to regulate the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic function of plants and animals and for connected purposes.

All the foregoing national laws have some issues that may affect pollinators in their implementation, but notably, most of them hardly mention pollinators.⁴¹ There is no dedicated

³⁶ Ibid, para. 2.2.

³⁷ Ibid, para. 4.10.1.

³⁸ Ibid, para. 4.10.2.

³⁹ Republic of Kenya, *National Environment Policy 2012*, (Government printer, 2012, Nairobi), p. 19.

⁴⁰ Cap 346, Laws of Kenya, Revised Edition 2012 [1985].

⁴¹ See also the *Wildlife Conservation and Management Act, No.47 of 2013*, Laws of Kenya, which provides for, inter alia, protection, conservation, sustainable use and management of wildlife in Kenya and for connected purposes. Its scope includes "biodiversity" and "biological resources" the latter of which is defined to include genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity; See also the *Forest Conservation and*

law that is meant to protect the pollinators and currently, their protection can only be done within the framework of all the above laws.

4. Safeguarding the Future: Addressing the Challenges Affecting Pollinators

It has rightly been pointed out that insect pollinators of crops and wild plants are under threat globally and their decline or loss could have profound economic and environmental consequences.⁴² Specifically, insect pollinators are believed to face growing pressure from the effects of intensified land use, climate change, alien species, and the spread of pests and pathogens; and this has serious implications for human food security and health, and ecosystem function.⁴³

There is need to avert the danger facing pollinators, and this can be achieved through various ways. While some require radical change in management approaches, others require all stakeholders to work closely and also include other relevant but often ignored groups in implementing decisions.

4.1 Ecosystem Services Approach to Pollinators Conservation

Studies have indicated that ecological restoration is likely to lead to large increases in both biodiversity and ecosystem services, offering a potential win-win solution if the two goals are combined in restoration projects.⁴⁴

The Convention on Biological Diversity (CBD) defines the ecosystem approach as follows:⁴⁵

Management Act, 2016 (No 34 of 2016) which was enacted to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes. The Act envisages sustainable management of forest resources for purposes of inter alia, biodiversity; See also the *Wildlife Conservation and Management (Protection of Endangered and Threatened Ecosystems, Habitats and Species) Regulations, 2017*, Legal Notice No. 242 of 2017, which were enacted to (a) implement the classification of ecosystems, habitats and species into the following categories critically endangered; endangered; vulnerable; protected; and threatened; (b) provide for protection of ecosystems that are threatened or endangered so as to maintain their ecological integrity; (c) provide for the protection of species that are threatened, endangered, vulnerable, or protected to ensure their survival in the wild; (d) implement Kenya's obligations under international agreements regulating international trade in endangered species; and (e) ensure sustainable management and utilisation of biodiversity.

⁴² Vanbergen, A.J., "Threats to an ecosystem service: pressures on pollinators," *Frontiers in Ecology and the Environment*, Vol.11, No. 5, 2013, pp.251-259.

⁴³ Ibid, p. 251.

⁴⁴ Rey Benayas, J.M., Newton, A.C., Diaz, A. & Bullock, J.M., 'Enhancement of Biodiversity and Ecosystem Services by Ecological Restoration: A Meta-Analysis,' *Science*, Vol.28, No.325, 2009, pp. 1121-1124. (As quoted in Dolf de Groot, 'Improved biodiversity and ecosystem services go hand-in-hand,' *Science for Environment Policy – A Weekly News Alert*, Special Issue: Ecosystem Services, Issue 20, May 2010, p.5.)

⁴⁵ *Convention on Biological Diversity* (2000) COP 5 Decision V/6 The ecosystem approach.

The Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Thus, the application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation; sustainable use; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems.

To effectively protect animal pollinators, there is a need to entrench biodiversity management and conservation approaches that eliminate or reduce human activities which pose risks to these organisms.

There is also need to empower communities in ways that give them alternative means of making a living for social sustainability as opposed to relying on environment only as well as enabling them make informed decisions that would contribute positively to environmental sustainability.⁴⁶ Integrated Environmental Management provides a set of underpinning principles and a suite of environmental assessment and management tools that are aimed at promoting sustainable development, such as Environmental Impact Assessment (EIA)⁴⁷, which is well developed and

⁴⁶ Muigua, K., "Realising the Right to Education for Environmental and Social Sustainability in Kenya," available at <http://www.kmco.co.ke/attachments/article/139/REALISING%20RIGHT%20TO%20EDUCATION%20FORENVIRONMENTAL%20AND%20SOCIAL%20%20JUSTICE%20IN%20KENYA-%20%2022nd%20%20October%20edited.pdf>

⁴⁷ For instance, Article 6b of the *Convention on Biological Diversity* provides that each Contracting Party should, in accordance with its particular conditions and capabilities, inter alia, integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 14 (1) (b) thereof also provides that each Contracting Party, as far as possible and as appropriate, should, inter alia, introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account.

The need for EIA was also succinctly expressed in Principle 17 of the 1992 *Rio Declaration on Environment and Development* which affords the strongest evidence of international support for EIA in the following terms;

Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant impact on the environment and are subject to a decision of a competent authority. (1992 Rio Declaration on Environment and Development, UN Doc. A/CONF.151/26 (vol. I) / 31 ILM 874 (1992).

mandatory world-wide⁴⁸, Strategic Environmental Assessment (SEA)⁴⁹ which helps to ensure that many of the environmental issues of global importance are considered in policies, plans and programmes at different administrative levels (i.e. national, regional, local)⁵⁰, and Environmental Audit⁵¹ which is the systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing in conserving or preserving the environment. Kenya has in place a number of other legislation that are relevant to this subject, and would be effective if fully implemented.⁵² For instance, the *Environmental*

⁴⁸ DEAT, *Overview of Integrated Environmental Management, Integrated Environmental Management, Information Series 0*, Department of Environmental Affairs and Tourism (DEAT), Pretoria, 2004, p.2. Available at <https://www.environment.gov.za/sites/default/files/docs/series0%20overview.pdf>

⁴⁹ While the parent Act (EMCA) was initially silent on SEA, the same was introduced via the *Environmental Management and Co-ordination (Amendment) Act, 2015* (Amendment Act, No. 5 of 2015, Laws of Kenya). The Amendment Act 2015 introduces a definition of SEA under section 2 thereof to mean ‘a formal and systematic process to analyse and address the environmental effects of policies, plans, programmes and other strategic initiatives’. The Amendment Act also amended EMCA by introducing section 57A (1) which provides that all Policies, Plans and Programmes for implementation should be subjected to Strategic Environmental Assessment (S. 42, *Environmental Management and Co-ordination (Amendment) Act, 2015*.)

⁵⁰ Fischer, T.B., ‘Strategic environmental assessment in post-modern times,’ *Environmental Impact Assessment Review*, Vol.23, 2003, pp.155–170 at p. 162.

⁵¹ Environmental auditing has been defined as a process whereby an organisation’s environmental performance is tested against numerous requirements, for example, clearly defined policies, legislated requirements and key performance indicators. (DEAT, *Overview of Integrated Environmental Management, Integrated Environmental Management*, op cit., p. 12); Sec. 2 of EMCA also defines “environmental audit” to mean the systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing in conserving or preserving the environment.

Sec. 68(1) of EMCA envisages Environmental Audit and Monitoring and provides that ‘the Authority shall be responsible for carrying out environmental audit of all activities that are likely to have significant effect on the environment. An environmental inspector appointed under this Act may enter any land or premises for the purposes of determining how far the activities carried out on that land or premises conform with the statements made in the environmental impact assessment study report issued in respect of that land or those premises under section 58(2).

(2) The owner of the premises or the operator of a project for which an environmental impact assessment study report has been made shall keep accurate records and make annual reports to the Authority describing how far the project conforms in operation with the statements made in the environmental impact assessment study report submitted under section 58(2).

(3) The owner of premises or the operator of a project shall take all reasonable measures to mitigate any undesirable effects not contemplated in the environmental impact assessment study report submitted under section 58(2) and shall prepare and submit an environmental audit report on those measures to the Authority annually or as the Authority may, in writing, require.

⁵² For instance, see the *Environmental (Impact Assessment and Audit) Regulations, 2003*, Legal Notice No. 101 of 2003 which are to apply to all policies, plans, programmes, project and activities specified in Part IV, Part V and the Second Schedule of the Act. Regulation 4 thereof provides that no proponent shall implement a project -(a) likely to have a negative environmental impact; or (b) for which an environmental impact assessment is required under the Act or these Regulations; unless an environmental impact assessment has been concluded and approved in accordance with these Regulations. It is however worth pointing out that the National Environment Management Authority, pursuant to the Environmental Management and Coordination Act, Cap 387, has since prepared the draft *Environmental (Strategic*

Management And Coordination (Conservation of Biological Diversity And Resources, Access To Genetic Resources And Benefit Sharing) Regulations, 2016 which were enacted to repeal the *Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006*⁵³ provides that a person should not engage in any activity that may- have an adverse impact on any ecosystem; lead to the introduction of any exotic species; lead to unsustainable use of natural resources, without an Environmental Impact Assessment Licence issued by the Authority under the Act.⁵⁴

Such provisions, coupled with other laws, if effectively implemented, would go a long way in ensuring that environment-degrading activities that adversely affect pollinators are reduced or eliminated.

4.2 Reduction or Effective Control of Pesticide Use

A joint Report by the United Nations Food and Agriculture Organisation and Intergovernmental Technical Panel on Soils of the Global Soil Partnership⁵⁵ comprehensively renders a high-level scientific opinion on the effects of plant protection products on soil functions and biodiversity. However, while acknowledging that critical issues such as toxicity in non-soil dwelling organisms (e.g. pollinators, birds, larger mammals) and transport of contaminants to the human food chain are of equal or greater importance, the same are not covered by the Report which dwells mainly on the effect of the said products on soil-dwelling organisms. While this assessment by FAO may not be directly relevant to the subject of discussion in this paper, it demonstrates the serious and broad effect the excessive use of pesticides can have on various organisms.

Pest control practices such as Integrated Pest Management that enhance natural pest controls are believed to be effective to reduce or eliminate the use of Pesticides (herbicides, insecticides, fungicides), while at the same time, they greatly benefit pollinators which may be heavily impacted by pesticides.⁵⁶ It has been suggested that adoption of integrated pest management (IPM) programs can limit pesticide usage to times of economic damage and spraying at certain

Assessment, Integrated Impact Assessment and Audit) Regulations, 2017 intended to repeal the *Environmental (Impact Assessment and Audit) Regulations, 2003*.

The overall objective of the *Environmental (Strategic Assessment, Integrated Impact Assessment and Audit) Regulations, 2017* is to align it to the *Environmental Management and Coordination Act, Cap 387* which was amended in 2015. The Regulations also seek to address emerging issues such as Strategic Environmental Assessments; environmental and social safeguard procedures and Climate Change. (https://www.nema.go.ke/index.php?option=com_content&view=article&id=32&Itemid=174)

⁵³ *Environmental Management and Co-ordination Act, No. 8 of 1999, Legal Notice No. 160 of 2006.*

⁵⁴ *Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2016, Regulation No. 5.*

⁵⁵ FAO and ITPS, *Global assessment of the impact of plant protection products on soil functions and soil ecosystems*, (Rome, FAO, 2017). Available at <http://www.fao.org/3/I8168EN/i8168en.pdf>

⁵⁶ Food and Agricultural Organisation of the United Nations, "Pollination Services for Crop Production: Managing Ecosystem Services for Productive and Healthy Agroecosystems," available at <http://www.fao.org/3/a-at109e.pdf> [Accessed on 29/11/2017].

times in the pest and crop life cycles, through which pest control can be maximized and amount of pesticide used minimized.⁵⁷ This calls for closer working relationship between farmers and the agricultural extension services officers for sensitisation and education on the same.

Scholars have also suggested that incentives should be offered to farmers to restore pollinator-friendly habitats, including flower provisioning within or around crop fields and elimination of use of insecticides by adopting agroecological production methods.⁵⁸ Additionally, conventional farmers are advised to be extremely cautious in the choice, timing, and application of insecticides and other chemicals.⁵⁹ Agriculture is believed to pose many threats to insect pollinators such as changes in land use, loss and fragmentation of habitat, introduction of exotic organisms, modern agricultural practices, and pesticide use.⁶⁰

The *Pest Control Products Act* defines “pest” to mean any injurious, noxious or troublesome insect, fungus, bacterial organism, virus, weed, rodent or other plant or animal pest; and includes any injurious, noxious or troublesome organic function of a plant or animal.⁶¹ This definition is arguably very broad and quite generic in that any product meant to eliminate the defined organisms is also likely to have adverse effects on the non-harmful or useful organisms. It is therefore important for the Pest Control Products Board to work closely with all the relevant stakeholders in the sector in order to ensure that the approved products have minimal adverse effects on non-targeted organisms.

The Pest Control Products Board established under the Act is empowered to: assess and evaluate pest control products in accordance with the provisions of the regulations made under the Act; consider applications for registration of pest control products and to make recommendations thereon to the Minister; and advise the Minister on all matters relating to the enforcement of the provisions of this Act and regulations made thereunder.⁶²

Such a Board ought to closely work with the scientific and technology community and the general public especially the agricultural and pastoral communities in order to reduce or eliminate the use of harmful pesticide products, as a way of minimizing destruction of pollinators and their habitats.

The Board should also have representatives in agricultural trainings and seminars in order to sensitize farmers on any outlawed or potentially dangerous pesticides that have broad spectrum effect on pollinators. This is important for ensuring that the information disseminated to farmers

⁵⁷ Kings River Conservation District (KRCD), “Agricultural Management Practices,” available at http://www.krkd.org/water/water_quality/ag_mgt_practices.html [Accessed on 4/01/2018].

⁵⁸ Nicholls, C.I. & Altieri, M.A., "Plant Biodiversity Enhances Bees and Other Insect Pollinators in Agroecosystems: A Review," *Agronomy for Sustainable development*, Vol.33, No. 2, 2013, pp.257-274 at p. 257.

⁵⁹ *Ibid.*, p.257.

⁶⁰ *Ibid.*, p.258.

⁶¹ *Pest Control Products Act*, sec.2.

⁶² *Ibid.*, Sec. 5 & 6.

is up-to-date and germane. Such information should also be widely publicized in languages and media that are easy to understand. It is imperative that the general public appreciates that pesticide use is not only harmful to human health but also affects other organisms that may be non-harmful to crop production or even beneficial, as pollinators.

4.3 Environmental Education, Awareness and Ethics

It has been opined that a lack of clear and sustained environmental awareness in many African countries has contributed to environmental degradation within the continent.⁶³ One of the ways of addressing this problem would be promoting environmental education geared towards raising such awareness and environmental ethics.⁶⁴ There have been efforts to address this problem especially by the United Nations and affiliated organisations such as United Nations Environmental Programme (UNEP) which set up the Africa Environmental Education and Training Action Plan (AEETAP) following the 2012 Arusha Declaration 18, which states:

*To agree to strengthen environmental education and training and develop an action plan for Africa, covering formal and non-formal education, capacity-building and information networking components, among others, and to explicitly include a focus on technology enhanced learning in this action plan.*⁶⁵

Environmental education has been defined as ‘a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment, thus enabling individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions.’⁶⁶

The *Environmental Management and Co-ordination Act, 1999*⁶⁷ defines environmental education to include ‘the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his biophysical surroundings.’⁶⁸

The identifiable components of environmental education are: Awareness and sensitivity to the environment and environmental challenges; Knowledge and understanding of the environment and environmental challenges; Attitudes of concern for the environment and motivation to improve or maintain environmental quality; Skills to identify and help resolve environmental

⁶³ Heila Lotz-Sisitka, H.L., et. al., *Africa Environmental Education and Training Action Plan 2015-2024: Strengthening Sustainable Development in Africa*, (United Nations Environment Programme, January, 2017), p.1.

⁶⁴ Ibid.

⁶⁵ Ibid., p. 5.

⁶⁶ United States Environmental Protection Agency, ‘What is Environmental Education?’ available at <http://www2.epa.gov/education/what-environmental-education> [Accessed on 20/01/2018].

⁶⁷ No. 8 of 1999, Laws of Kenya.

⁶⁸ Ibid., sec. 2.

challenges; and participation in activities that lead to the resolution of environmental challenges.⁶⁹

If empowered through education, people are able to make their own decisions especially in matters relating to exploitation of natural resources, Environmental Impact Assessment (EIA) and other matters that touch on development but have a bearing on the environment and the livelihoods of the people. The local communities would be able to actively engage potential investors in ensuring environmental sustainability. Principles of public participation⁷⁰ in governance and environmental democracy⁷¹ as envisaged in the current Constitution of Kenya becomes easier to implement.

There is an urgent need to ensure that appreciation and concern for the environment are instilled during the early years of development.⁷² It is important to ensure that all sections of the general public understand the fact that provision of most of the economic and social rights as guaranteed in the Constitution of Kenya 2010 is dependent on the state of the environment.⁷³ As such, environmental matters must be taken seriously and any factors or activities that adversely affect the environment should be minimised or eliminated.

⁶⁹ United States Environmental Protection Agency, *op.cit*; See also the touchstone definition of “environmental education” which was developed in a 1978 UNESCO conference and published in the “Tbilisi Declaration.”

⁷⁰ The *Aarhus Convention (Convention on Access To Information, Public Participation In Decision-Making And Access to Justice in Environmental Matters done at Aarhus, Denmark, on 25 June 1998)* (Article 7), *Stockholm Declaration on the Human Environment Stockholm, June 1972* (Principle 19) and the *Rio Declaration on Environment and Development Rio De Janeiro June 1992* (principle 10) all recognise the need to involve the populace in environmental decision-making. Principle 19 of the Stockholm Declaration advocates for education in environmental matters for the younger generation as well as the adults giving due consideration to the underprivileged in order to broaden the basis for an *enlightened opinion* and responsible conduct by individuals enterprises and communities in protecting and improving the environment in its full human dimension. (emphasis added) Principle 10 of the Rio Declaration further affirms the importance of environmental democracy. It provides that environmental issues are best handled with participation of all concerned citizens are relevant level. At the national level each individual shall have access to appropriate information concerning the environment that is held by Public authorities including information on hazardous materials and activities in their communities and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings including redress and remedy shall be provided.

⁷¹ See Article 69 of the Constitution of Kenya; For a more detailed discussion, see also Muigua, K. & Musyimi, P.N., ‘Enhancing Environmental Democracy in Kenya,’ available at http://www.kmco.co.ke/attachments/article/81/072_Envntal_Dem_Kenya.pdf

⁷² Muigua, K., “Realising the Right to Education for Environmental and Social Sustainability in Kenya,” *op. cit.*, p.9.

⁷³ See generally, A. Boyle, “Human Rights and the Environment: A Reassessment,” *Boyle UNEP Paper Revised*.

Anthropocentric⁷⁴ and ecocentric⁷⁵ approaches should be well entrenched in environmental management in order to promote the notion that all living organisms, including pollinators, should be accorded legal protection and their habitats protected as part of the universe not necessarily because of the benefits that accrue from their ecological activities.

4.4 Use of Scientific Research and Traditional Knowledge

Continuous scientific research on the effects of various agricultural practices on biodiversity conservation is key in any efforts geared towards protecting animal pollinators. The International Centre of Insect Physiology and Ecology (ICIPE), based in Kenya, conducts research on African insect problems associated with food and health.⁷⁶

There is need for concerted efforts from the Government agencies concerned with agriculture and scientific research to work closely with ICIPE to address some of the problems facing these important players for the realisation of sustainable development agenda.

Agenda 21 advocates for this by calling for improvement in communication and cooperation among the scientific and technological community, decision makers and the public. Notably, Agenda 21 provides that the scientific and technological community and policy makers should increase their interaction in order to implement strategies for sustainable development on the basis of the best available knowledge. This implies that decision makers should provide the necessary framework for rigorous research and for full and open communication of the findings of the scientific and technological community, and develop with it ways in which research results and the concerns stemming from the findings can be communicated to decision-making bodies so as to better link scientific and technical knowledge with strategic policy and programme formulation. At the same time, this dialogue would assist the scientific and technological community in developing priorities for research and proposing actions for constructive solutions.⁷⁷

Arguably, such communication between the scientific and technological community and the policy and lawmakers would go a long way in coming up with policies and laws that are more responsive to the need to protect pollinators. Generalized laws on conservation of biodiversity may not be very effective in addressing the specific challenges affecting pollinators. While the framework law such as EMCA envisages provisions on protection of biodiversity⁷⁸, a closer

⁷⁴ It considers human beings as the centre or the most important being in the universe and looks at nature and its resources in terms of the benefits that accrue to the humankind (Murdy, W.H., "Anthropocentrism: A Modern Version," *Science*, New Series, Vol. 187, No. 4182 (Mar. 28, 1975), pp. 1168-1172).

⁷⁵ It is an approach that is based on nature-centred as opposed to human-centre system of values. (Amérigo, M., Aragonés, J., De Frutos, B., Sevillano, V., & Cortés, B., "Underlying Dimensions of Ecocentric and Anthropocentric Environmental Beliefs," *The Spanish Journal of Psychology*, 10(1), 2007, 97-103. doi:10.1017/S1138741600006351).

⁷⁶ http://www.icipe.org/about/mission_and_vision

⁷⁷ Agenda 21, para. 31.2.

⁷⁸ Sec. 50-53, EMCA, 1999.

working relationship between the policy and lawmakers and the scientific and technological community would ensure drafting of effective sectoral laws or guidelines that fully protect pollinators.

The Convention on Biological Diversity Secretariat recommends that one of the ways of implementing the Aichi Biodiversity Target 7 would be incorporating customary use of biodiversity by indigenous and local communities, which can often offer lessons of wider applicability and could be enhanced by increasingly delegating governance and management responsibility to the local level.⁷⁹

The Constitution of Kenya 2010 also supports this idea by providing that it recognises culture as the foundation of the nation and as the cumulative civilization of the Kenyan people and nation.⁸⁰ In addition, it requires the State to, inter alia: recognise the role of science and indigenous technologies in the development of the nation; and promote the intellectual property rights of the people of Kenya.⁸¹ Parliament is also required to enact legislation to, inter alia, recognise and protect the ownership of indigenous seeds and plant varieties, their genetic and diverse characteristics and their use by the communities of Kenya.⁸²

Article 69(1) thereof also obligates the State to, inter alia: ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; work to achieve and maintain a tree cover of at least ten percent of the land area of Kenya; protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities; encourage public participation in the management, protection and conservation of the environment; protect genetic resources and biological diversity; eliminate processes and activities that are likely to endanger the environment; and utilise the environment and natural resources for the benefit of the people of Kenya. Additionally, the Constitution places a duty on every person to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.⁸³

Notably, Parliament has since come up with the *Protection of Traditional Knowledge and Cultural Expressions Act*, 2016⁸⁴ which was enacted to provide a framework for the protection and promotion of traditional knowledge and cultural expressions; to give effect to Articles 11, 40 and 69(1) (c) of the Constitution; and for connected purposes. The Act defines "traditional knowledge"

⁷⁹ Convention on Biological Diversity Secretariat, "TARGET 7 - Technical Rationale extended (provided in document COP/10/INF/12/Rev.1)," op. cit.

⁸⁰ Constitution of Kenya 2010, Art. 11(1).

⁸¹ Ibid, Art. 11(2).

⁸² Ibid, Art. 11(3).

⁸³ Art. 69(2), Constitution of Kenya 2010.

⁸⁴ No. 33 of 2016, Laws of Kenya.

to mean any knowledge- originating from an individual, local or traditional community that is the result of intellectual activity and insight in a traditional context, including know-how, skills, innovations, practices and learning, embodied in the traditional lifestyle of a community; or contained in the codified knowledge systems passed on from one generation to another including agricultural, environmental or medical knowledge, knowledge associated with genetic resources or other components of biological diversity, and know-how of traditional architecture, construction technologies, designs, marks and indications.⁸⁵

Traditional knowledge can play a critical role in eliminating some of the problems affecting animal pollinators such as excessive use of pesticides. Traditional farming and conservation practices can go a long way in reducing the use of pesticides in crop production. The general public and specifically the agricultural communities would also benefit from closer working relationships between them and the government agencies to appreciate how some of the traditional practices in farming can be incorporated into their modern farming practices as a way of reducing the use of harmful chemicals in crop production as well as discarding some of the destructive farming practices.

It is important to note that the protection of traditional knowledge or cultural expressions as envisaged in the foregoing Act should: not restrict or hinder the normal usage, development, exchange, dissemination and transmission of traditional knowledge or cultural expressions by members of a particular community within the traditional practices and in accordance with the customary law and practices of that community.⁸⁶ Communities can and should be encouraged and supported to therefore actively utilise traditional knowledge especially relating to agricultural, environmental and knowledge associated with genetic resources or other components of biological diversity in achieving sustainable agricultural production and enhancing protection of the health of animal pollinators.

The knowledge can also be used together with scientific knowledge to come up with agricultural crops that are fairly resistant to some pests thus reducing the indiscriminate use of pesticides. Some of the traditional farming practices coupled with relevant scientific knowledge can also go a long way in achieving elimination or lower pollution levels on the farm or used in wider areas including, indigenous knowledge of soil management, agricultural practices, animal husbandry, irrigation system, crop breeding, harvesting and storage which have been traditionally used successfully and in a sustainable manner.⁸⁷ Some of the traditional farming practices that have been cited as capable of protecting pollinators while enhancing sustainable agricultural production include farmers improving the biological stability and resilience of the system by

⁸⁵ *Protection of Traditional Knowledge and Cultural Expressions Act, 2016, sec. 2.*

⁸⁶ *Protection of Traditional Knowledge and Cultural Expressions Act, 2016, sec. 19(1).*

⁸⁷Thakuria, G., 'Traditional Knowledge for Sustainable Development: A Geographical Analysis,' *International Journal of Research in Applied, Natural and Social Sciences*, Vol. 2, Issue 9, Sep 2014, 39-44, p.42.

choosing more suitable crops, rotating them, growing a mixture of crops, and irrigating, mulching and manuring land.⁸⁸

It has been suggested that in order to promote sustainable development, partnership between the scientific and technological communities and indigenous people in many areas are essential, which should be founded upon mutual respect and understanding, transparent and open dialogue, and informed consent and just returns for the holders of traditional knowledge through reward and benefits.⁸⁹ A working relationship based on such grounds can potentially enhance conservation measures especially for the pollinators.

4.5 Addressing Climate Change

As part of efforts geared towards protection of animal pollinators and their habitats, there is need to continually address the problem of climate change, as set out in 1992 United Nations Framework Convention on Climate Change (UNFCCC)⁹⁰ which is an intergovernmental treaty developed to address the problem of climate change. Scholars have rightly suggested that climate change may be one of the biggest anthropogenic disturbance factors imposed on ecosystems today.⁹¹ These studies have concluded that climate change affects plants, pollinators and their interactions through increased temperatures, disturbances on rainfall pattern and other many environmental changes, including alteration in the native biodiversity and trophic relationship which result in lower the production of crops.⁹²

The *Agenda 2030 on Sustainable Development* urges countries to take urgent action to combat climate change and its impacts.⁹³ In response to this, Kenya has since taken commendable measures aimed at tackling the problem of climate change. Kenya's *Climate Change Act, 2016*⁹⁴ was enacted to provide for the legal and institutional framework for the mitigation and adaptation to the effects of climate change; to facilitate and enhance response to climate change; to provide for the guidance and measures to achieve low carbon climate resilient development and for connected purposes.⁹⁵ It is important that the provisions of this Act be implemented across the

⁸⁸ Hayati, D., Zahra R. & Ezatollah, K., "Measuring agricultural sustainability," In *biodiversity, biofuels, agroforestry and conservation agriculture*, Springer Netherlands, 2010, pp. 73-100 at p.74.

⁸⁹ Thakuria, G., 'Traditional Knowledge for Sustainable Development: A Geographical Analysis,' op cit., p.43.

⁹⁰ UN General Assembly, *United Nations Framework Convention on Climate Change: resolution / adopted by the General Assembly*, 20 January 1994, A/RES/48/189.

⁹¹ Pudasaini, R., et al., "Effect of climate change on insect pollinator: a review," *New York Science Journal*, Vol. 8, No.3, 2015, pp.39-42 at p.40.

⁹² Ibid.

⁹³ United Nations, *Transforming our world: the 2030 Agenda for Sustainable Development*, Goal 13.

⁹⁴ No. 11 of 2016, Laws of Kenya.

⁹⁵ Ibid, preamble. The Act, *inter alia*, provides: a framework for mitigating and adapting to the effects of climate change on all sectors of the economy and levels of governance; a mechanism for coordination and governance of matters relating to climate change; coordination mechanism for formulation of programmes and plans to enhance the resilience of human and ecological systems against the impacts of climate change; for mainstreaming of the principle of sustainable development in the planning for and on climate change

various sectors, especially the ones with a direct impact on environment and biodiversity in particular. Within this framework, it is important to continue tackling the problem of climate change and its effect on biodiversity, especially the animal pollinators.

5 Conclusion

It has rightly been argued that since sustainable development is a continuous process that considers all human and natural resource as a means to achieve certain goals or objectives, this development process should not be contradictory with nature but should instead be ecologically comfortable, economically viable and socially acceptable.⁹⁶ The protection and conservation of natural resources for future generations arguably depends on, inter alia, pollinators.

Pollinators have an important role to play in crop and food production as well as realisation of the sustainable development agenda. There is need to put in place and employ active and conscious mechanisms specifically geared towards protection of the animal pollinators against adverse effects arising from human activities. Such measures must however go beyond legal responses and include scientific and cultural aspects especially in relation to crop production. Safeguarding pollinators is a part of sustainable development and is crucial for the realisation of food and nutritional security in Kenya, and indeed worldwide. This neglected link between pollinators and sustainable development needs to be addressed as a matter of urgency.

response strategies and actions; for promotion of social and economic measures in climate change responses to support sustainable human development; and a mechanism for coordination of measuring, verification and reporting of climate interventions (S.3 (1)).

⁹⁶ Thakuria, G., 'Traditional Knowledge for Sustainable Development: A Geographical Analysis,' op cit., p.39.

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