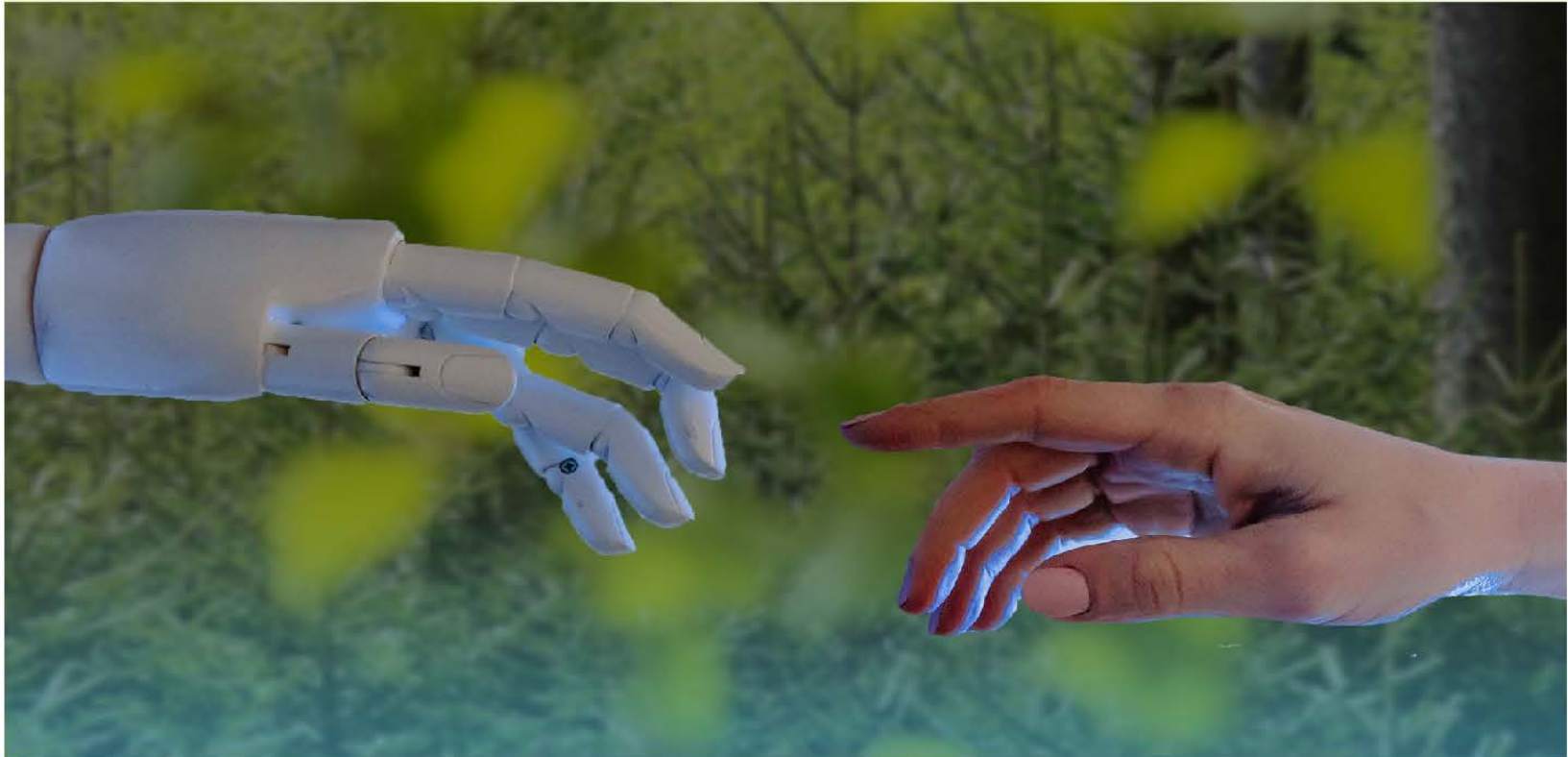




Maat for Peace, Development and Human Rights
in collaboration with
The African Center for Artificial Intelligence and
Digital Technology



More Realistic Solutions
Opportunities to Benefit from AI
Applications to Achieve
Environmental Sustainability in
North African countries

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Towards More Realistic Solutions Potential Opportunities of Using Artificial Intelligence Applications to Achieve Environmental Sustainability in North African Countries

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Executive Summary

Environmental crises represent an existential threat to humanity. It jeopardizes the realization of all human rights for present and future generations. Air, water, and soil pollution, the three main components of the ecosystem, as well as the ongoing rise in global temperatures and extreme climate changes, put citizens across the world in precarious conditions. Therefore, several stakeholders from countries, civil society organizations, and companies were motivated to try to use the considerable capabilities of machine learning and artificial intelligence to achieve environmental sustainability. In this regard, environmental disasters have become a grim reality in North African countries, threatening an imminent danger that would destroy the lives, health and livelihoods of citizens. Many people die due to air pollution-related diseases, such as cardiovascular and respiratory diseases. In the same context, many citizens may suffer endlessly due to dwindling rainfall and high rates of drought caused by climate changes that threaten food and water security in the region. Moreover, many people may find themselves forced to leave their homes because of droughts and storms. Therefore, citizens must be protected from unbridled environmental disasters and their inevitable effects. Accordingly, this study discusses the potential opportunities of using artificial intelligence and machine learning to enhance response to environmental disasters in the North African region, by highlighting the environmental problems in this region, in addition to presenting some of the successful efforts made across the world in the use of artificial intelligence to enhance environmental sustainability and tried to get some insights that could help change the current environmental situation in North African countries.

Keywords: environmental disasters - artificial intelligence - North Africa.

Study Methodology

The study used a mixed legal approach that relies in the process of documenting and collecting information on processes to enhance environmental sustainability based on artificial intelligence and machine learning applications, on a semi-complete review of all the activities of countries, civil society groups, companies and international bodies concerned, in order to determine their position in employing artificial intelligence applications in combating environmental disasters, in addition to reviewing the various facts and government data that dealt with environmental disasters in the North African region, whether it is air, water, or soil pollution, droughts and the scarcity of rainfall due to climate change, to name a few. The approach will not be satisfied with collecting information, but rather it will analyze and classify it to know its impact and assess the risks resulting from it



on the rights of citizens. The approach also relied on statements and interviews published on the internet for activists and actors in the environmental field, academics and pioneers in the field of artificial intelligence, who talked about paying more attention to artificial intelligence technologies that are used or may be used in the future to support activities aimed at promoting environmental sustainability and combating environmentally-related disasters.

Introduction

Environmental crises pose a clear and widespread threat to human rights around the world. With the increase in urban and industrial areas in various parts of the world, as well as the intensification of the effects of harmful natural disasters associated with extreme climate change, the lives, health, and livelihoods of citizens will inevitably be affected at all levels. In this way, and in recent times, human rights voices have escalated warning of the hidden danger to citizens around the world as a result of long-term environmental crises, but it seems that these voices will not be heard, as extreme climate changes, along with air and water pollution and other crises and environmental damage, resulted in the fall of the humanitarian situation to the edge of the abyss, human rights have been plagued by a global crisis, the victims of which are mostly marginalized groups and poor communities. For example, the World Health Organization expects that climate change will kill 250,000 people per year between 2030 and 2050, due to diseases associated with climate change phenomena such as malaria, malnutrition, diarrhea, and heat stress¹. In the midst of this, and by 2030, climate change will push more than 130 million people into poverty, in addition to placing 200 million people in conditions that compel them to receive emergency humanitarian assistance on a regular basis. Not only that, but by 2050, climate-related crises could lead to the displacement of 1.2 billion people, most of them are concentrated in the Sahel, South Africa, Middle East, and Central Asia².

effects of environmental issues on human rights, as the region suffers from common environmental problems that are manifested in high rates of air and water pollution alike, in addition to the phenomenon of extreme climate, which often leads to catastrophic results. For example, the increase in temperatures associated with climatic changes will reduce the areas of arable land in addition to shortening the duration of the growing seasons and reducing crop yields, in addition to increasing drought rates due to the lack of rainfall, all of

¹ Climate change and health. World Health Organization. February 2018 <https://bit.ly/2Qk5d9B>

² A Roadmap for Managing Disasters How Climate-Vulnerable Countries Can Use Tech. **The Tony Blair Institute for Global Change**. December 2021. <https://bit.ly/3M8gK3B>



which affect the right of citizens to obtain food. In the same regard, the floods caused by climate change will represent a direct threat to lives and livelihoods³.

As the world celebrates World Environment Day every year on June 5, we find it an opportunity to reflect on the progress made to enhance environmental sustainability and preserve biodiversity, as well as provide clean water and pure air, in addition to combating the impact of climate change resulting from global warming. In this way, many experiences appeared recently and have proven beyond any doubt that the applications of artificial intelligence can be one of the solutions to solve major global environmental crises, and it is estimated that artificial intelligence and digital technology may lead to a 10-20% reduction in global carbon dioxide emissions by 2030, which is reflected positively on the recovery of the environment⁴.

In this context, this study discusses opportunities for using artificial intelligence applications to achieve environmental sustainability in the North African region, by highlighting the experiences in which many countries, civil society groups or companies have succeeded in using artificial intelligence in addressing various environmental issues and the lessons learned from these experiences, not to mention discussing the environmental situation in North African countries and benefiting from successful international experiences in addressing this aggravating situation, while calling on all stakeholders from governments, civil society organizations and companies to benefit from the applications of artificial intelligence to achieve environmental sustainability in North Africa.

The role of artificial intelligence applications in achieving environmental sustainability

Many stakeholders, whether states, civil society groups or corporations, have realized the disappointing situation that humanity has reached due to successive environmental crises, and have begun to use many innovative ways to combat the consequences of the most harmful environmental crises, leading to a reduction in human rights violations resulting from them. Among the most prominent of these methods was the use of artificial intelligence techniques to protect the environment and conserve resources, whether as early warning systems by predicting and preparing for disasters related to extreme climatic changes and predicting the resulting forced displacement, or by providing humanitarian aid to those affected by environmental crises with assessing the various bad effects resulting from these

³ التكيف مع تغير المناخ في شمال أفريقيا: الظروف المناخية المستقبلية وحلول إدارة المحاصيل والمياه، المركز الدولي للزراعة الملحية، <https://bit.ly/3NwVc1T>

⁴ Ensuring Equitable Digital Futures for Everyone .UNDP Libya .<https://bit.ly/3Q11BDS>



crises, or by working to reduce the levels of greenhouse gas emissions to the closest possible level. The Paris Agreement on Climate Change indicates the need to reduce emissions by 45% by 2030 and reach net zero emissions by 2050, or by monitoring air and water pollution and unjust fishing operations and deforestation, or the preservation of the health of the oceans as well as of biodiversity. At the same time, using artificial intelligence to design basic infrastructure capable of dealing with environmental crises⁵.

In the midst of this, artificial intelligence systems play a key role as early warning systems to predict natural disasters related to climate change. For example, floods cause severe damage to the infrastructure of countries, in addition to the death of many citizens and the displacement of families. Therefore, monitoring flood operations on a continuous basis helps governments to determine their severe impacts and plan for relief operations⁶. In this way, the Flood Forecasting Initiative, in which Google cooperated with many governments, is working to protect citizens from flood damage as much as possible by developing systems based on artificial intelligence that predict when and where floods occur, if this happens, it will improve the lives of more than 200 million people who suffer from floods in India and 40 million people who suffer from the same matter in Bangladesh⁷.

Meanwhile, the morphological inundation model, which combines physics-based techniques and machine learning, is working to predict floods in India and Bangladesh, improving the lives of 250 million people who are constantly at risk of flooding⁸. In the same regard, the satellite technology for forecasting floods in Bangladesh and India in 2018 saved many lives with previous warnings of impending floods in multiple regions⁹. In Nepal, a monitoring panel using artificial intelligence techniques was established by the United Nations Center for Satellites to monitor and forecast floods¹⁰, as predicting future disasters can help relief organizations reduce the damage caused by them. For example, machine vision technology based on artificial intelligence analyzes images of roads that have been damaged or destroyed due to environmental disasters, thus allowing for a faster and safer response by humanitarian organizations¹¹. This is in conjunction with the development of some techniques based on artificial intelligence to predict forced displacement in places such

⁵ Can AI Help Achieve Environmental Sustainability?. **Earthorg**. March 2021. <https://bit.ly/3INN3K6>

⁶ Integrating remote sensing and social sensing for flood mapping. **Sciencedirect**. January 2022. <https://bit.ly/3LV9NCu>

⁷ A big step for flood forecasts in India and Bangladesh. **Google**. <https://bit.ly/37inGZF>

⁸ The Technology Behind our Recent Improvements in Flood Forecasting. **Googleblog**<https://bit.ly/37ipstN>

⁹ Role of digital technologies in climate change adaptation solutions. **India Water Portal**. December 2021. <https://bit.ly/3uOHcte>

¹⁰ UNOSAT S-1 Flood AI Monitoring Dashboard (Nepal). **UN NIP**. <https://bit.ly/3GpTixf>

¹¹ Using AI to help save lives. **Microsoft**. <https://bit.ly/3wGJKbX>



as Burkina Faso, Mali, Niger and Nigeria in West Africa and other areas where natural disasters are active, which contributes to identifying aspects of humanitarian assistance provided to civilians in the event of displacement situations, particularly in floods, storms, and heavy rains¹².

In this context, many applications of artificial intelligence are working to improve food security related to climate change. With the wide availability of high-resolution images from satellite and aerial based on artificial intelligence, it has become possible to monitor crop conditions and agricultural productivity on a large scale¹³.

AI technologies provide services to those affected by climate disasters and assess damage arising from climate disasters. AI technologies are integrated into the analysis of flood satellite imagery to report rapid response and assess and compensate for various harms. UNOSAT improves the timeliness of disaster response, downloading images of flood-prone areas automatically and processing them by machine learning algorithms to produce disaster maps and determine the optimum handling. For example, when tropical cyclone Eloise hit parts of central Mozambique and experienced heavy rainfall, UNOSAT drew a quick map to assess flood damage¹⁴.

Many stakeholders promoted flood detection through satellite imagery using machine learning techniques to enhance responsiveness to climate changes within many areas, especially within refugee camps. In 2020, several AI techniques were used to monitor the situation after heavy monsoon rains in Bangladesh, Myanmar, and Mozambique to assess the appropriate response to damage¹⁵. In Kenya, artificial intelligence evaluates disasters and estimates damage through predictive mapping of crises and AI-supported responses¹⁶.

Many AI applications reduce greenhouse gas emission levels and reduce energy damage in various industries. Many companies use artificial intelligence to help steel plants reduce their industry's CO2 emissions by 450.000 tons per year¹⁷. Many estimates and studies suggest that AI-based machine learning is a powerful tool for reducing greenhouse gas emissions¹⁸. Excel Energy also uses artificial intelligence to predict energy consumption patterns and adapt its operating systems to reduce greenhouse gas emissions. In contrast,

¹² OSM MALAWI: OSM MAPPING FOR REFUGEES - A CASE OF DZALEKA CAMP, MALAWI. Hotosm. <https://bit.ly/3ioUJ4p>

¹³ OPEN CLIMATE FIX. <https://bit.ly/3z4s90T>

¹⁴ SATELLITE IMAGE ANALYSIS FOR DISASTER MAPPING. **Preventionweb**. April 2021. <https://bit.ly/3wTYW6r>

¹⁵ UNOSAT at CERN: Satellite mapping for the good of humanity. **the European Organization for Nuclear Research**. JULY, 2021. <https://bit.ly/3wVeh7Z>

¹⁶ Use and Impact of Artificial Intelligence on Climate Change Adaptation in Africa. **Springer link** . <https://bit.ly/3wW13b0>

¹⁷ CLIMATE CHANGE AND AI Recommendations for Government Action. **Climate Change AI and the Centre for AI & Climate** . <https://bit.ly/3GptKQN>

¹⁸ Tackling Climate Change with Machine Learning. **arXiv**. <https://bit.ly/3t1Cell>



sensors and smart meters can be deployed inside buildings to collect data, monitor and analyze and improve energy use in buildings to reduce greenhouse gas emissions to preserve the environment¹⁹.

Many AI applications are very good at monitoring air pollution, improving its quality, and monitoring poaching and deforestation. Smart air purifiers using artificial intelligence can record air quality and environmental data moment by moment and work to increase the efficiency of air filters. AI-powered devices can also send warnings to people living in cities and urban areas about pollution levels in their areas²⁰. Companies use AI algorithms to analyze data from tank control sensors, wells, water booths, and individual taps to detect water pollution²¹.

Artificial intelligence is used to prevent poaching that harms the environment. In Cambodia, an artificial intelligence program based on machine learning was designed to predict poaching to reduce it and protect wildlife. The software uses machine learning to predict hunters' behavior based on previous data²²; Drones with infrared cameras and Microsoft's Azor Machine Learning Program combat poaching²³.

AI systems support biodiversity and preserve the health of the oceans. AI is used to detect changes in biodiversity around the world and collect data from difficult or inaccessible ocean sites to maintain ocean health. AI robots monitor ocean conditions such as pollution levels, temperature, and pH, supporting the ocean environment²⁴.

Many countries, civil society organizations, and companies have successfully used AI applications to promote environmental conservation and combat climate change; three different successful experiences are reviewed below to identify and build on the reasons for their success in building other experiences in the future; it can present these experiences in detail as follows: -

In Georgia, the Government has established an integrated climate risk management system in cooperation with UNDP and substantial funding from the Green Climate Fund. AI was used to monitor extreme climatic conditions in this system, especially those related to

¹⁹ Can AI Help Achieve Environmental Sustainability. cit

<https://bit.ly/3atZIPZ> ، ٢٠٢١ مايو ، الجزيرة، التحديات البيئية، الذكاء الاصطناعي سلاح جديد في يد البشرية لمواجهة التحديات البيئية، الجزيرة، مايو ٢٠٢١ ، <https://bit.ly/3atZIPZ>

²¹ Use and Impact of Artificial Intelligence on Climate Change Adaptation in Africa. Cit

²² AI is for Animals: using Artificial Intelligence to prevent poaching. **the Association of American Universities**. July, 2019.

<https://bit.ly/38gra0c>

²³ الذكاء الاصطناعي لحل التحديات البيئية، البيان ، أكتوبر ٢٠١٨ ، <https://bit.ly/3asR2cB>

²⁴ Can AI Help Achieve Environmental Sustainability. Cit



temperature increases using machine learning models, predicted disasters related to climate change, and many responses are developed to deal with them²⁵.

The AI algorithm developed by UNOSAT is used to detect climate change-related floods in many regions across the world and detect rains associated with climate change. These algorithms map out post-disaster models to identify appropriate responses by Governments. This model was used in Myanmar, Mozambique, and many regions where climate disasters are continuously frequent²⁶.

Favorable climatic conditions allowed pest proliferation in East Africa, South-West Asia, and the area around the Red Sea, such as locust proliferation associated with climate change in Kenya and many African countries. A Kenya-based agricultural social company has been developing an AI-based tool, especially machine learning, to help farmers adapt to climate change early as an early warning to protect crops from destruction²⁷.

Clear evidence: an overview of threats related to environmental disasters in North Africa

Environmental-related disasters, high rates of drought, extreme heatwaves, desertification, loss of biodiversity and forest fires, floods and storms, and air, water, and soil pollution affect human rights throughout North Africa. These phenomena have affected the region's citizens due to water shortages, food insecurity, increased rates of disease, epidemics and deaths caused by rising or falling temperatures, and the impact of climate extremism on the infrastructure of poorer citizens in the form of partial or total destruction of their property, and the death of many of them from environmental diseases associated with air and water pollution.

All affect the human right to life, adequate food, and access to safe drinking water and quality sanitation. These impacts affect populations already in vulnerable situations due to geographical location, gender, poverty, age, disability, membership of ethnic minorities and indigenous peoples, and conflicts, particularly in Libya.

Agricultural production may decrease in many North African countries, negatively reflecting food security levels and exacerbating malnutrition. In Africa, 118 million people are likely to suffer from extreme poverty, and of course, part is in North Africa. Fishing in

²⁵ Artificial Intelligence for Disaster Risk Reduction: Opportunities, challenges, and prospects. **World Meteorological Organization**. <https://bit.ly/3xefSor>

²⁶ UNOSAT INTRODUCES AI IN ITS FLOOD RAPID MAPPING OPERATIONS FOR THE BENEFIT OF NATIONAL DISASTER MANAGEMENT AUTHORITIES. **United Nations Institute for Training and Research**. August 2020. <https://bit.ly/3t397o0>

²⁷ Using Artificial Intelligence to avoid the next locust plague. Selinawamucii. <https://bit.ly/3IPHwma>

many African countries could drop by 30% by the year²⁸; the decrease in fish harvesting causes more than 70 million people in Africa to experience iron deficiencies, up to 188 million to lack vitamin A, 285 million to vitamin B12, and omega-3 fatty acids²⁹.

Infrastructure is increasingly at risk and total and partial destruction, including population buildings. By 2030, 108-116 million people will be exposed to sea-level rise in Africa and some coastal areas in Tunisia and Egypt, destroying population buildings and infrastructure³⁰. Climate changes will bring economic growth across Africa to low levels. Africa's GDP may fall by 3% by 2050³¹. In the same vein, the erosion of large areas of sandy beaches in the North African region, especially in Egypt and Tunisia, will lead to rising displacement waves³².

Thus, in Egypt, the most important environmental issues are water scarcity, air pollution and rising sea levels. In addition to, being affected by extreme climatic changes. In this regard, government estimates have confirmed that climate changes will have negative impacts on the ecosystem. The most important of which is the rise in average temperatures as well as the increase in the weather phenomena such as storms and floods as sea levels are rising and its effects on coastal areas. Not to mention the impact on water resources and increasing water scarcity which ultimately leads to the deterioration of agricultural production and the public health of citizens and this negatively effects the right of citizens to obtain food, as well as the right to health.³³

In this context, Egypt's agricultural productivity has been affected by temperature rates. High temperatures have led to a decrease in the production of fruit and vegetable by 50%, exposing the farmers to huge losses and the consumers to high prices. Due to the low supply compared to the increase of demand. In the same regard, the sea creatures are at risk especially coral reefs which seriously threatens the tourism sector.³⁴

One the other hand, air pollution remains one of the biggest threats to public health in Egypt. There is a significant increase in the environmental diseases. It is estimated that air pollution costs Egypt more than \$30 billion in providing health care and losing economic productivity every year. In 2019, Egypt recorded more than 150 early deaths of 100,000

²⁸ From Africa to Asia, supporting fisheries to address climate change impacts. World bank. FEBRUARY 11, 2022.

<https://bit.ly/3Cz2CND>

²⁹ Africans at risk of famine, drought and displacement, U.N. climate report warns. Nbcnews. Feber. 28, 2022,

<https://nbcnews.to/3HU3wol>

³⁰ UN: Africa, already suffering from warming, will see worse. Abcnews. March 2022. <https://abcn.ws/3sR8iyW>

³¹ تسارع التغير المناخي في أفريقيا يهدد 118 مليون إنسان، الطلقة ، أكتوبر ٢٠٢١ ، <https://bit.ly/3tH6nMH>

³² سواحل الدلتا والشواطئ الرملية في شمال أفريقيا أكثر هشاشة مما نتوقع. للعلم ، فبراير ٢٠٢١ ، <https://bit.ly/3x3EYGI>

³³ ، فبراير ٢٠٢٢ ، <https://bit.ly/3PZSJhX> عواصف وسيول وشح مائي... تأثيرات خطيرة لتغير المناخ على مصر، مصر اوي ، فبراير ٢٠٢٢ ،

³⁴ التغيرات المناخية في مصر التداعيات وآليات التكيف، مركز الأهرام والدراسات السياسية ، أكتوبر ٢٠٢١ ، <https://bit.ly/3MbTC3O>

person due to diseases related to air pollution³⁵. Despite, the efforts of the Egyptian Government and some companies in using AI applications to reduce the negative impact of environmental changes as they will not rise to the required level. In August 2020, Egypt's Ministry of Agriculture worked in collaboration with the Ministry of Communications to introduce AI to measure the impact of climate change and rationalize the use of water in irrigation by analyzing various data.³⁶

In Morocco, it will not be much different as the country is exposed to drought, desertification and widespread loss of biodiversity. It suffering from the effects of extreme climate change from increased average temperatures, decrease in rainfall and high rates of drought and floods. In 2021, Morocco faced a scarcity of rainfall, resulting in drought rates rising significantly. This has led the Government to reduce water-consuming crop cultivation in large quantities.³⁷

In this context, the environmental problems resulting from the multi-source pollution that affects several regions on both sides of the Atlantic and the Mediterranean Sea seriously damage many beaches rich in fisheries³⁸. However, air pollution causes more than 5,000 deaths in Morocco and costs the state 11 billion dirhams annually³⁹. All previous changes affect the citizens' right to health care and food.

In Tunisia, many humanitarian activities such as overfishing, forest burning, logging and urban sprawl have contributed to the deterioration of coastal and marine ecosystems and freshwater systems, in addition to the significant air and water pollution⁴⁰. On the other hand, according to research estimates, Tunisia produces about 2.5 million Tons of household waste annually and it contains an important proportion of organic matter, while the proportion of plastic in it is 11% and paper is 10%, and this threatens the health of individuals as well as the impact on livestock and marine wealth. It is worth noting that there is a rise in the proportion of deaths caused About annual air pollution. Tunisia occupies the third place in the percentage of pollution in the African region.⁴¹

The government estimates that annual rainfall rates will decrease by 10% in the north-west and 30% in the south of the country by 2050. In conjunction with increased temperatures, especially in the state of Tataouine in the far south. However, many areas will

³⁵ القاهرة تختلق بفاتورة تلوث الهواء، شركة انتربرايز ، أبريل ٢٠٢٢ ، <https://bit.ly/3xf6T7A>

³⁶ Egypt to introduce artificial intelligence in irrigation water management .<https://bit.ly/3NPAhXm>

³⁷ إجراءات استثنائية في المغرب لمواجهة الجفاف، اسكاي نيوز ، فبراير ٢٠٢٢ ، <https://bit.ly/391gqpC>

³⁸ المغرب الاستهتار بخضر النفايات يهدد التنمية والأسماك، دي دبليو الألمانية، <https://bit.ly/3xf8f2a>

³⁹ تلوث الهواء يسبب أكثر من ٥,٠٠٠ حالة وفاة في المغرب ويكبد الدولة ١١ مليار درهم سنوياً، يونيو ٢٠٢٠ ، <https://bit.ly/3wZtJi8>

⁴⁰ نظرة على مشاكل تونس البيئية، <https://bit.ly/3Mj0NKG>

⁴¹ تونس بحاجة الى اعلان حالة الطوارئ البيئية، ميدل إيست أولان، <https://bit.ly/3GRd18Z>

be exposed to sea drift and estimates indicate that the Bay of Hammamet area could be exposed to sea drift on approximately 1,900 hectares, especially at the Sabkha Sidi Khalifa level.⁴²

On the other hand, the problem of the spread of rubbish in Libya has led to the outbreak of leukemia due to the activity of ferret vectors in the garbage, and the problem of the spread of rubbish and waste costs the Libyan economy annually nearly half a billion dinars. (\$300 million) annually, in the same context Libya is exposed to extreme weather events such as sand emotions, droughts and water scarcity, In April 2022, severe and large-scale sandstorms struck Libya s economic development and expected temperature increases are detrimental to agriculture, which has a significant impact on citizens' food security.

On the other hand, the spread of garbage in Libya has caused an outbreak of cutaneous leishmaniasis due to the activity of vectors of the disease from rodents in the garbage. The problem of the spread of garbage and waste costs the Libyan economy annually nearly half a billion dinars (300 million dollars) annually⁴³. In the same context, Libya is exposed to climatic phenomena such as sandy emotions, droughts and water scarcity. In April 2022, severe and large-scale sandstorms struck⁴⁴ Libya's economic development and expected temperature increases are detrimental to agriculture, which has a significant impact on citizens' food security.⁴⁵

In Mauritania, the capital Nouakchott is ranked on the list of the ten cities most vulnerable to drowning due to climate change. As most of its neighborhoods are located below the water level of the Atlantic Ocean, along with its dilapidated and fragile infrastructure. On the other hand, there is an increase in desertification and drought rates, which leads to high rates of displacement from regions Various rural areas.⁴⁶ In northern Mauritania, there is an increase in the environmental pollution as a result of the activity of mining companies, which puts the health of citizens on the brink of a hobby and presenting serious consequences.⁴⁷

Algeria suffers from many environmental problems such as air, water and soil pollution, desertification, the spread of waste and the depletion of water resources. Air and water pollution cause respiratory diseases and the spread of diseases and epidemics⁴⁸, air

⁴² <https://bit.ly/3GMO5zu> تونس: التهديد المناخي على الأبواب،

⁴³ <https://bit.ly/3mffeSd> الوضع البيئي في ليبيا. كابوس آخر يعمّر حية الليبيين، بوابة إفريقيا الإخبارية،

⁴⁴ Dust off the Libya Coast. <https://go.nasa.gov/3Q47eRJ>

⁴⁵ <https://bit.ly/3xdGqqW> تغير المناخ يهدد التنمية الاقتصادية والاستدامة في ليبيا، أغسطس ٢٠٢١،

⁴⁶ <https://bit.ly/3zh5aQl> التغيرات المناخية العاصمة الموريتانية تواجه خطر الغرق، العربي،

⁴⁷ موريتانيا: الشكوى المتجددة من تلوث البيئة، السفير، <https://bit.ly/3Njc8c1>

⁴⁸ <https://bit.ly/3zhkV9V> مخاطر التلوث البيئي في الجزائر وأبرز حلوله،

pollution is estimated to cause nearly 2,500 deaths per year⁴⁹. In the same regard, climate change causes a significant increase in temperatures, which leads to an increase in fire rates and drought, as estimates confirm that more than 90 people have died due to forest fires caused by high temperatures in 2021⁵⁰.

In this context, human rights estimates warned that climate changes threaten Algeria with a wide range of climatic and geological risks, from floods, earthquakes and forest fires, to drought and coastal and soil erosion. The same estimates revealed that floods accounted for 60% of the catastrophic events in Algeria, affecting more than 800,000 people across the country, with economic losses exceeding 1.5 billion US dollars. It is worth noting, that the Algerian capital is vulnerable to collapse due to harmful climate changes.⁵¹

From the previous presentation it is clear that all North African countries are experiencing high drought rates as well as exacerbating air pollution problems. In addition to, the escalation of threats to coastal towns by disappearing and forcing citizens to migrate in the future. This affects citizens' right to medical care and food as well as the right to housing. However, it dissipates economic development efforts, and it is worth noting that the use of AI applications to overcome these problems is still emerging and needs further efforts.

Leveraging international expertise that has used AI to achieve environmental sustainability and its application to North African Countries

International efforts to combat environmental disasters based on AI applications have demonstrated a number of lessons to be learned and taken into account in talking about reducing the impacts of adverse environmental disasters in the Middle East region, including:

- With regard to the problems of air pollution experienced by many countries, mainly Algeria and Egypt, the use of smart air purification that works to use artificial intelligence to record air quality and environmental data should be utilized at a moment's notice, and work to increase the efficiency of different air filters.
- Regarding natural disasters associated with climate change that threaten Libya, Algeria and the coastal areas of Egypt and Mauritania, AI systems should be used as an early warning to predict and try to reduce such disasters, as well as to enhance the humanitarian response of those affected. Satellite technology must be used to

⁴⁹ <https://bit.ly/3xe6vGn> الجزائر: تلوث الهواء راجع أساسا لانبعاثات الغازات بسبب حركة المرور الحضري، وكالة الأنباء الجزائرية ،

⁵⁰ <https://bit.ly/3NSvIvn> النظرة إلى مناخ أفريقيا "المستطرف" الذي لا تتأقنه التقارير، الإندبينت البريطانية ، سبتمبر ٢٠٢١ ،

⁵¹ <https://bit.ly/3mjU5WY> تقرير دولي: تغير المناخ يهدد الجزائر بفيضانات وانهيارات أرضية، الطاقة ، ديسمبر ٢٠٢١ ،

predict floods that may hit Morocco or floods that hit Egypt constantly. In this regard, AI-based automated vision technology can be used to analyze damage from climate disasters and provide appropriate humanitarian response to those affected.

- In terms of reducing greenhouse gas emission levels as well as energy damage in different industries, it is possible to use in-house sensors and smart meters to collect data, monitor and analyze and improve energy use in buildings to reduce greenhouse gas emissions to preserve the environment.
- Regarding the detection of changes in biodiversity, the use of artificial intelligence robots to monitor ocean and lake conditions such as pollution levels, temperature and pH should be studied, especially in the coastal cities of Morocco, Tunisia and Algeria.
- With regard to the spread of insects and pollution-related diseases, it is possible to take advantage of the experiences of Kenyan companies that have used artificial intelligence to detect pests and insects that threaten plants. The Libyan Government can use these techniques to reduce insects and vectors of diseases caused by environmental pollution.

In this context, North African countries continue to face a number of physical challenges related to reliance on AI applications in the fight against environmental disasters. The top of these challenges is the need for funding and various funds to invest in AI applications related to environmental sustainability. In addition to, increasing internal conflicts and terrorism, with a lack of technology awareness, especially the application of artificial intelligence among all government agencies within the countries of North Africa in conjunction with the continued use policies of major States that exacerbate climate problems without considering their impact on citizens in other regions of the world, as well as weak UN and human rights bodies in dealing with issues of integrating new technology into the fight against pressing environmental threats.

Recommendations

Finally, North African countries are far from using AI-based applications to achieve environmental sustainability, but a hope is the potential to benefit from successful international experiences in environmental disaster control by adopting AI. Therefore, the study recommends that:

- The need to rely on AI applications that predict adverse environmental disasters.

- The need to use AI applications in the fight against air and water pollution.
- The need to rely on AI applications to reduce greenhouse gas emission levels that cause extreme weather events.
- The need to strengthen cooperation among North African countries with regard to research and studies related to the promotion of artificial intelligence in the fight against environmental disasters, sharing experiences among them and strengthening cooperation in this regard.